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ABSTRACT

Presented in this guide are learning activities and related materials to assist teachers in preparing fifth-grade students for a visit to a nature study center. Activities are classified as to whether they are to be used before visiting the center, while at the center, or as culminating activities upon returning to the classroom. A pre- and posttest and a list of expected standards of conduct and safety for students are included. Materials for making transparencies, ditto sheets, and booklets are found in the supplement. Though this publication is designed for a specific site, it could be adapted for other sites. (BT)

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Preface

Environmental education is meant to improve the quality of life by making students aware of the world around them and to motivate them toward making it a better world.

By using the Bossier Parish Nature Study Center in a purposeful way we plan that the child will:

Develop a respect for nature, nature's laws, land and all natural resources (because respect underlies human welfare and dignity.)

Feel a reverence for life, both plant and animal.

Acquire a love of land and a love of our country.

Develop a sense of responsibility toward property and the rights of people who own property.

Recognize that there is dignity in purposeful outdoor work and in the development of personal skills.

Procedure

To insure that your trip to the Bossier Parish Nature Study Center is a worthwhile educational experience, you should set up a definite purpose. Then motivate the children so that the knowledge that you provide in the classroom will be reinforced and expanded upon at the Center.

Following are activities to teach and broaden the concepts found in Understanding Your Environment by Silver Burdett, Unit 3, Chapters 8 – 11 and Science in Our World by D. C. Heath, Chapters 9 and 10.

Some activities are designed to be used at the beginning of the Unit before visiting the Center. Some are best used while at the Center and others are to be employed as culminating activities upon returning to the classroom. Following each section are specific directions.

Those marked (*) are considered to be essential for the successful utilization of the Center. Seasonal activities are marked (+).

Materials for making transparencies, dittos and booklets are found in the supplement.

The test, which is found in the appendix, was designed to be given at the beginning of the unit to assess present knowledge and at the end of the unit to assess knowledge gained. In order for this program to be properly evaluated, you must give the pre-test and post-test.

Expected Standards of Conduct and Safety on the Trip

1. Children will stay on the marked trail.

2. Children are to make no collections without permission from the Center Director.

3. Children should wear comfortable walking shoes with socks and preferably long pants.

4. It is advisable to spray the children with insect repellent.

5. The teacher should acquaint the children with poison ivy and poison oak.

6. Children are not to pick up lizards, snakes or spiders.

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ACTIVITIES

THE WEB OF LIFE

Preliminary Classroom Activities

1. *Use transparency to discuss and explain the Web of Life the inter-relationships of nature (p. 3). Use duplicating masters and transparencies from Milliken & McDonalds on Ecology.
2. Emphasize importance of the Web by reading and discussing "Our Louisiana Land and Its Bounty."
3. *Develop observation skills by doing sensory exercise (p. 4).
4. *Develop vocabulary list appropriate to the Web of Life (p. 5).
5. Construct a chart listing food sample/source/green plants (p. 6).
6. Make a scrapbook of pictures showing uses of plants to emphasize importance of green plants.
7. *Describe your neighborhood biome using guide questions (p. 3). Refer to the Milliken Ecology Transparencies.
8. Present and learn the Conservation Pledge (p. 3).

Center Activities

1. Recall sensory exercise used in classroom and urge employment of these on the trail (p. 4).
2. While traveling to and from the Center, as well as while at the Center, have children observe the land as it is being used (farm, home, shop, recreation, etc.).
3. Compare plant communities on well managed land with unmanaged land.
4. Observe a rotting trunk and look for organisms that make up the habitat.
5. Observe enemies of plants (disease, insects, fire, etc.).

Culminating Classroom Activities

1. Draw or describe something to show how land was being used (farm, forest, shopping center, homes, etc.).

2. *Compare the neighborhood biome with the Cypress Lake biome (p. 3).

3. *Draw example of the Web of Life seen on the trip (cow eating grass, etc.).

Your Neighborhood: A Biome

by Richard Latta

A biome is a complex community of plants and animals whose character is primarily determined by soil and climatic conditions. Here is a description of how one teacher helped his students to understand the nature of a biome.

In our junior high science book we came across the word biome. I explained various biomes as the desert, an ocean, a lake, or tundra, but the definition was still somewhat vague. To remedy the situation, I suggested that we make a study of a simple, nearby biome – the biome of a neighborhood.

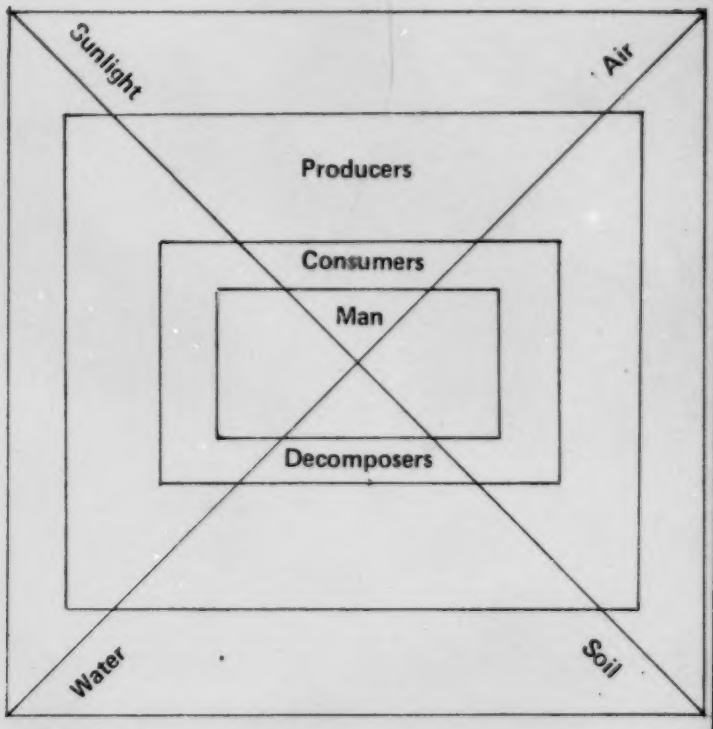
The following questions were put on a mimeographed sheet and youngsters were asked to complete information about their own neighborhood.

Count the trees on your block.
Is there grass in front of everyone's house?
Does any neighbor keep a garden?
Are there any dead trees on your block?
How many bushes are there?
Are weeds good for an environment?
Is there a pond on your block?
Is there a lake within six blocks of your house?
Are there any factories on your block?
How many houses are on your block?
How many people live on your block?
How many people live in your house?
How does your house contribute to pollution?
How does your house contribute to preventing pollution?
What animals live on your block?
Are there any empty lots on your block?

CONSERVATION PLEDGE

I give my
pledge as an American
to save and faithfully to
defend from waste the
natural resources of
my country – its soil
and minerals, its
forests, waters,
and wildlife

The Web of Life



SENSORY EXERCISE

1. Briefly describe your site (playground, trail, etc.). _____

_____

_____

2. What are the five most noticeable things about your site? (Could be odors, sights, sounds, etc.)

a. _____

b. _____

c. _____

d. _____

e. _____

3. Other than the trail itself, what evidence is there of man's presence? _____

_____

_____

4. Within your site, find and briefly describe examples of:

a) old age _____

b) perfect form _____

c) distorted form _____

d) man-altered form _____

e) movement _____

f) straight lines _____

g) death _____

h) life _____

5. How could people benefit from this site? _____

_____

_____

_____

VOCABULARY

abiotic	non-living such as soil, water, air.
adaptation	the changing to fit
biome	complex community of plants and animals whose character is determined by soil and climatic conditions.
biotic community	all the organisms, both plant and animal, that make up these food chains and webs.
consumers	living things that depend on other living things for their food.
ecology	interrelationships of living things in their environment. Greek word for "house", commonly called household of mother nature.
ecosystem	biotic (living) community interacting with its abiotic (non-living) counterpart.
environment	surroundings
extinction	no longer living
food chain or web of life	all the non-living things and producers, consumers and decomposers.
habitat	place where a plant or animal naturally lives.
niche	function or purpose of the organism
producers	green plants or food makers, source of food for most living things.

STUDENT WORKSHEET

ECOLOGY

TASK:

Show that most foods are the products of green plants.

MATERIALS:

Samples of foods (pictures of food, canned goods, fresh fruits, and vegetables)

PROCEDURE:

1. Make observations of food samples on display.
2. Indicate how each food sample is derived from green plants. (Use chart; see example.)

FOOD SAMPLE	SOURCE	GREEN PLANTS
1. *Milk*	*Cow*	*Grass*
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

SUMMARY:

What can you conclude about most food products?

ACTIVITIES

ROOTS, STEMS, LEAVES

Preliminary Classroom Activities

1. Label and learn diagrams for roots, stems, leaves (p.8).
2. *Label and learn difference in monocot and dicot plants (p. 9).
3. *Explain process of photosynthesis.
4. Demonstrate how a product of photosynthesis may be found (p. 8).
5. Observe and demonstrate plant transpiration (p. 10).
6. Examine how a plant "breathes" (p. 11–13).
7. *Familiarize students with the ten most common native trees including poisonous specimens using "Commercial Trees of Louisiana."

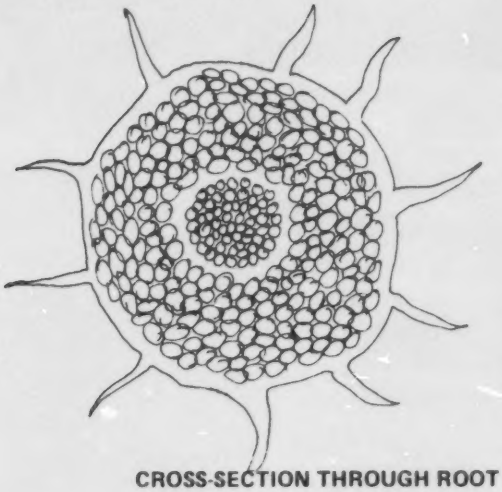
Center Activities

1. Tour Living Lab to observe specimens from the area.
2. Use microscopes to observe root hairs, stems (monocot and dicot).
3. Identify leaves while on the trail or from pressed examples at the Center.
4. Note the different stems with regard to size, shape, color, texture.

Culminating Classroom Activities

1. +Collect different types of stems, leaves that grow in your area (p. 14).
2. +Collect flowering plant, sketch, label and then press (p. 8).
3. Make blueprint specimens (p. 15).
4. Determine how much soil a plant uses (p. 16).

Identify and label the parts



CROSS-SECTION THROUGH ROOT

KEY to roots:

a. epidermis

b. root hairs

c. xylem

d. phloem

e. cortex

ROOT

a. _____

b. _____

c. _____

d. _____

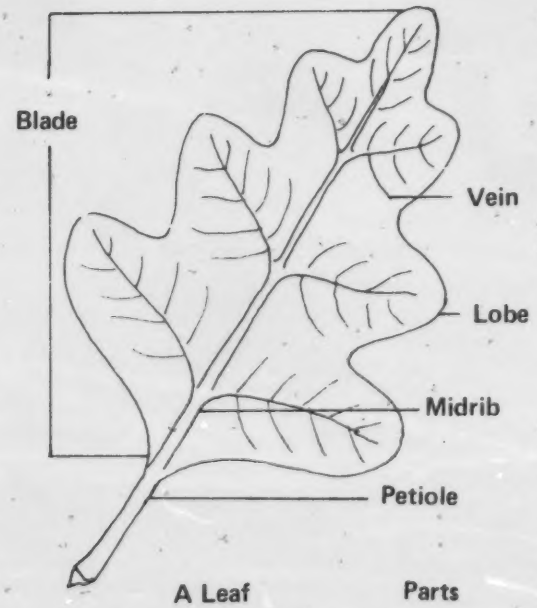
e. _____

FINDING A PRODUCT OF PHOTOSYNTHESIS

Materials you'll need:

Elodea, test tube, boiled water, cork, matches

Place a sprig of Elodea, a water plant, cut end up, in a test tube which is three-quarters full of boiled water which has first been permitted to cool. Cork the test tube and set it in a dark closet or drawer for an hour. Remove the cork and quickly hold a lighted match in the top of the tube. How brightly does the flame burn? Now repeat the process but place the test tube in the bright sunshine. Remove the cork and hold a lighted match in the tube after the plant has been in light for an hour. Does the flame burn brighter? What did the plant give off to cause this?



A Leaf Parts

COLLECT FLOWERING PLANTS

Be sure to get all roots, wash soil off, sketch flower in notebook, identify as many parts as possible, press all specimens in newspaper with bricks.

Plants on our Planet – Heath – Chapter 9
(Use pp. 246-247 to complete the answers)

_____
Last Name, First

Dicotyledons (have 1 or 2 food parts in the seeds) Circle 1

In a dicot stem the bundles of tubes are arranged in a r_____ around the edge of the stem. 246 Dicot stems form a n ____ r_____ of t_____ every year.

Dicots have leaves with the v_____ in a n _____. 247

Flowers that have their petals and stamens in groups of __ or___ are dicots. 247

Monocotyledons (have 1 or 2 food parts in the seeds) Circle 1

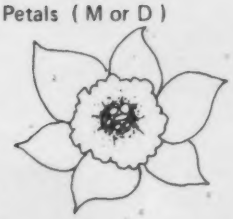
In a monocot stem the bundles of tubes are s_____throughout the stem; the tubes get l_____ , but no new layers are added. 246.

Monocots have leaves with v_____that are p_____. 247

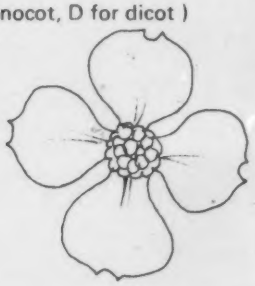
Monocot flowers have their petals and stamens in groups of__ , ___, or____. 247

(Use M for monocot, D for dicot)

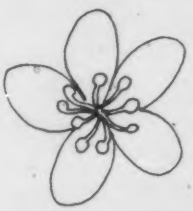
Petals (M or D)



1. _____



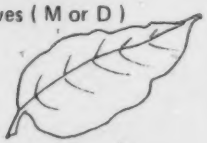
2. _____



3. _____

4. _____

Leaves (M or D)



5. _____

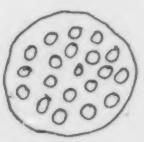
6. _____

7. _____

8. _____

Stems (M or D)

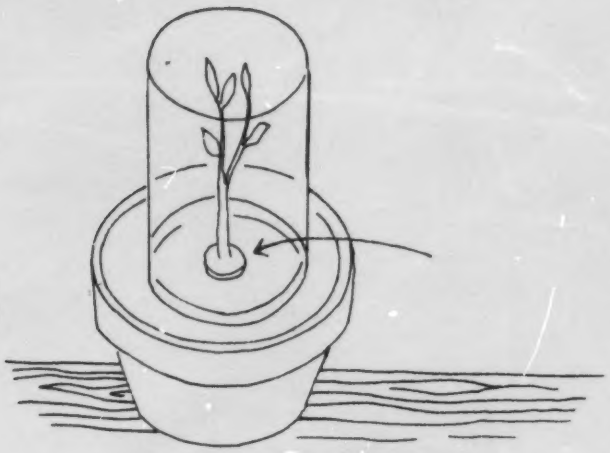
9. _____



10. _____

11. _____

12. _____



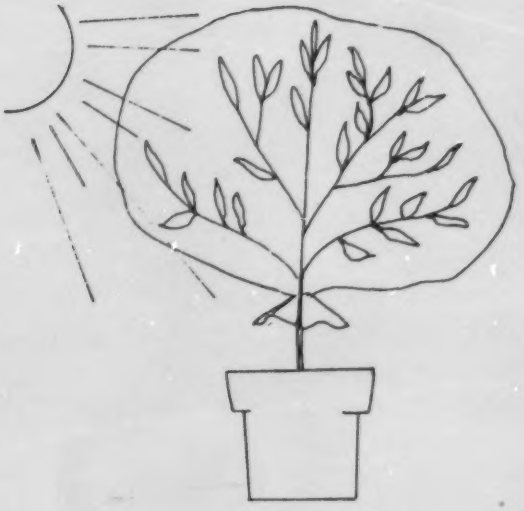
FINDING OUT THAT PLANTS BREATHE

Materials you'll need:
plant in flower pot, quart jar with screw top, paraffin

You probably have learned that plants take carbon dioxide from the air to use in making food. This is part of the process of photosynthesis. But did you realize that plants breathe and require oxygen just as animals do?

Grow a plant from seed in a large flower pot. A bean seed is a good one to use since the plant grows rapidly. When it is five or six inches tall and looks healthy, dig it up carefully so that you don't break it roots. Punch a hole in the lid of a jar large enough to pass the roots through. The roots should go through from the inside to the outside of the lid. Replant the roots in the flower pot so that the jar lid is upside down. Water the plant after replanting. Seal the hole around the stem with soft paraffin so that it is airtight. Screw the jar down into the lid.

Keep the plant in a dark place overnight. Unscrew the jar and very quickly drop a lighted match into the jar. It will go out immediately, indicating that oxygen has been used up and carbon dioxide produced inside the jar. The carbon dioxide was given off in the process of respiration. Why must the plant be kept in a dark place?



OBSERVING TRANSPIRATION IN PLANTS

Materials you'll need:
clear plastic bag, string, potted plant

Plant give off water through tiny openings on the undersides of their leaves, much as man gives off water through his skin. A large tree may lose gallons of water each day.

To observe this process of transpiration, tie a clear plastic bag over the leaves and stem of a plant. Be sure none of the plant touches the plastic except where the bag is tied securely around the stem just above soil level. Set the plant in the sun for several hours. Observe what happens on the inside of the bag.

A BREATH OF AIR

INTRODUCTION

Take an animal and take a green plant. A dog and a tulip. How different are they? The dog, you may say, is a living organism because it takes in food, grows, and reproduces. Also, the dog has to breathe to stay alive.

The tulip also does all these things. It has to breathe, too.

Plants breathe? Yet no one has ever found lungs in a plant. Instead, plants "breathe" through microscopic holes in their leaves. These tiny holes are called stomata (STOW - ma- tuh).

Like animals, plants need energy to live. A plant gets much of this energy for life by breathing or resipration (res - pih- RAY - shun). (In animals it's called breathing. For plants it's respiration.) Like an animal, a plant has to take in oxygen for respiration. This gas enters the leaves of the plant through the stomata.

A plant also gives off waste products. The waste products from plants are both carbon dioxide and oxygen, and they leave the plant through all the stomata. The oxygen then helps refill the oxygen taken from the air by breathing animals.

Therefore, you may say, plants help keep us alive.

INVESTIGATION

How does a leaf "breathe"?

MATERIALS

- microscope
- slide and cover slip
- lettuce leaves
- jar with cover
- medicine dropper
- forceps
- methylene blue stain
- small, potted plant
- tin foil
- 5% salt solution
- blotting paper

PROCEDURE

A. How do we know?

You read that carbon dioxide enters a leaf through microscopic openings, called stomata, and that oxygen goes out through the same openings. Now you are probably asking for proof. (At least you should be asking for proof.) Carbon dioxide and oxygen are gases which cannot be seen. Moisture also goes out through the stomata, and it can be seen.

Cover up the soil of a small, potted plant with tin foil. Put the plant in a glass jar. Cover with a tight-fitting cover. Place the jar in sunlight. To answer the question coming up, you will have to wait until the end of class. You might now read the question, and then go on with the rest of this study. Then answer the question at the end of the class.

What do you see happening inside the jar?

_____

_____

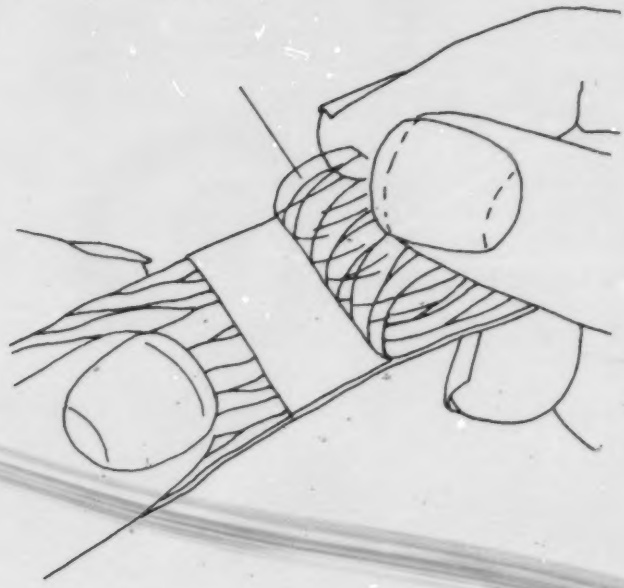
_____

Draw what you see.

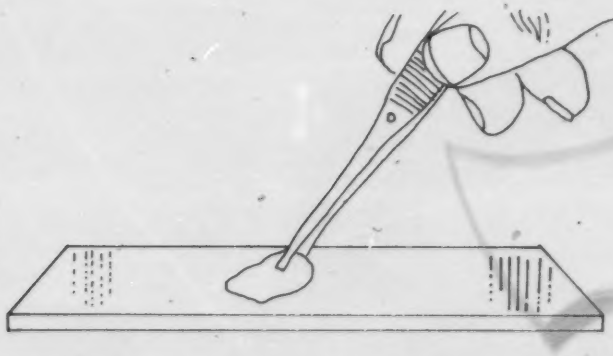
B. Open Stomata

While you are waiting for something to happen inside the jar, you will get a chance to look at stomata.

Take a small piece of a lettuce leaf. (The leaf should have been in a jar of cool water for a few hours before you get it. In this way, it will take in water and get stiff. It will then be good for study.) You're using a lettuce leaf because it show all the openings and cells very clearly.



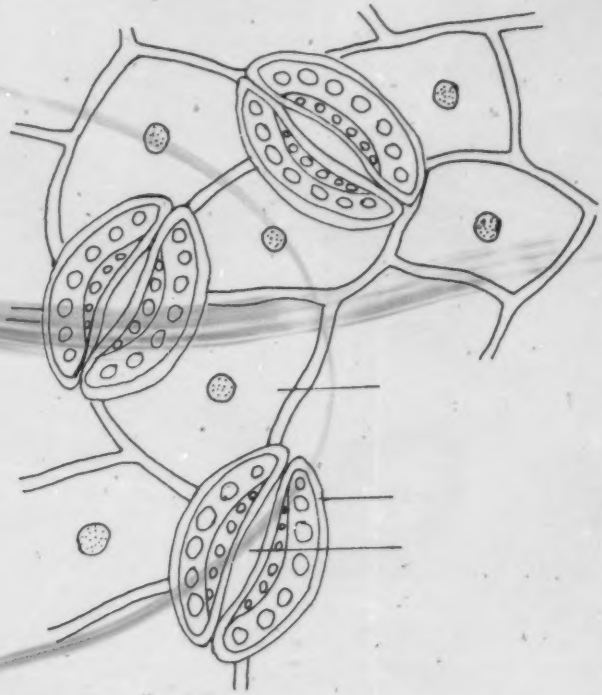
Fold your piece of leaf, and tear the leaf slowly along the fold. As you tear the piece, a thin layer should peel off or separate from either the top or bottom. This layer is very thin, doesn't have any color, and you can almost see through it (that is, it's almost transparent). Now tear off a small piece of this transparent layer. Make sure you have only one thin layer. Place it in a drop of methylene blue stain on a microscope slide.



The thin layer of leaf should lie flat on the slide. If it's folded over, use your forceps to unfold it and smooth it down.

First look at the piece of leaf under the low-power lens. Then switch to the high-power. Draw what you see.

Here is a drawing of a piece of lettuce leaf as it might look under a high-power lens.



Look carefully at the stomata in the diagram. The stomata are shown open. Stomata open during the day. It is during the day when most of the gases enter and leave a plant. The important gas that enters, during the day is carbon dioxide (CO_2). With CO_2, water, and sunlight, a green plant is able to make

simple sugars. These sugars are the food a plant needs to make it grow and to keep it alive. But this food can be made only with the help of sunlight.

It is also during the day that oxygen goes out through the open stomata.

Go back to your microscope and find some open stomata. You can then fix up the stomata you drew when you first looked at the leaf. Or you can draw new ones, as they now look to you under the microscope.

You must have noticed, either on the diagram or under the microscope, a cell on each side of every stomata. These are called guard cells. Guard cells cause the stomata to open and close. If you don't have them in your drawings, add them. (Make sure you know what they look like first.)

C. Closed Stomata

Up to now, you have been looking at the cells that make up a leaf and at the open stomata. Stomata usually close at night. So does your school. And even if you got your classroom dark, you would still need light to look through your microscope. You can, however, make the stomata close and see them, too, with a 5% salt solution.

Prepare a piece of lettuce for study as you did before. (Or use the one you looked at before.) Now place a small piece of blotting paper at one side of the cover slip. Have it touch the cover slip.

Take up some 5% salt solution in a medicine dropper, and add a few drops at the other edge of the cover slip.

The blotting paper will soak up the water that was already under the cover slip. Take away the blotting paper after it has soaked up the water. The salt solution will then slide under.

Wait a minute or two, and then look closely at the stomata. Do you see anything different? Draw and tell what you see.

Don't forget to look at the plant in the jar, and answer that question. (The tin foil, by the way, stops water from getting out of or into the soil.)

SUMMARY

1. What are stomata?

_____

_____

_____

2. What do guard cells do in a leaf?

_____

_____

_____

COLLECTING AND PRESERVING LEAVES

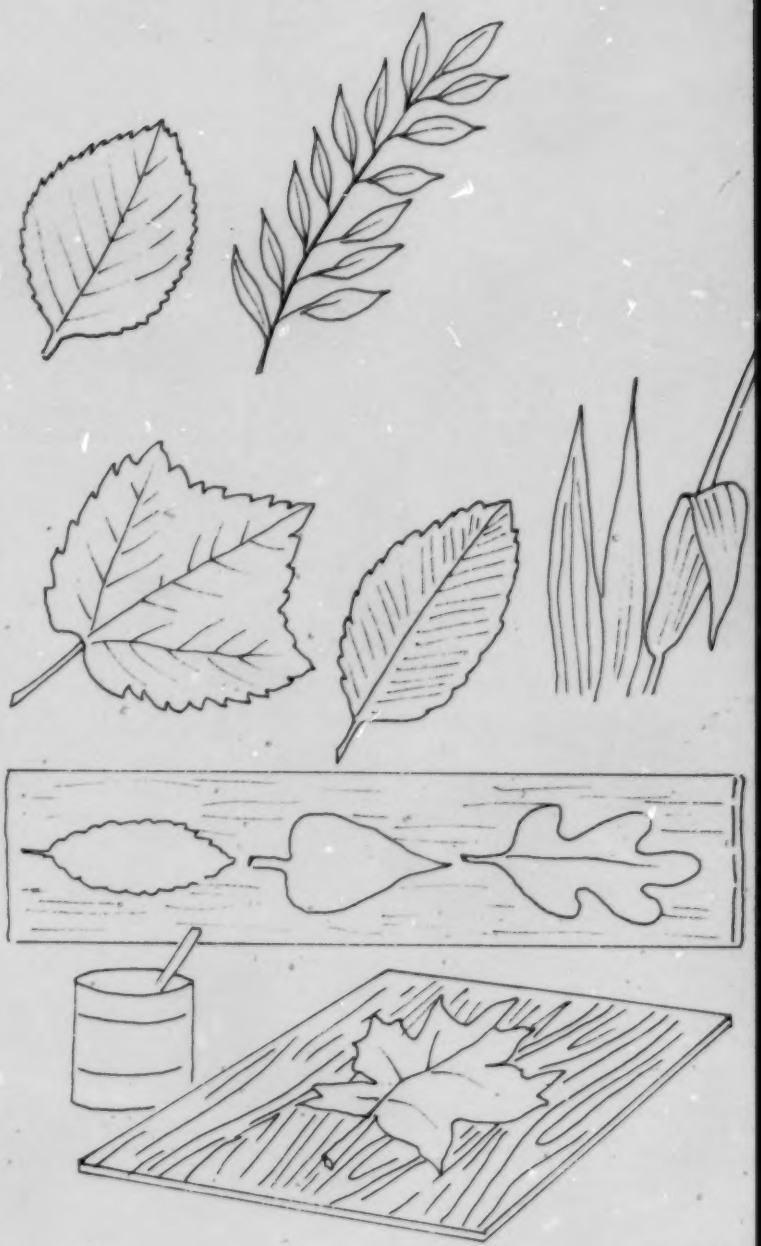
Materials you'll need:

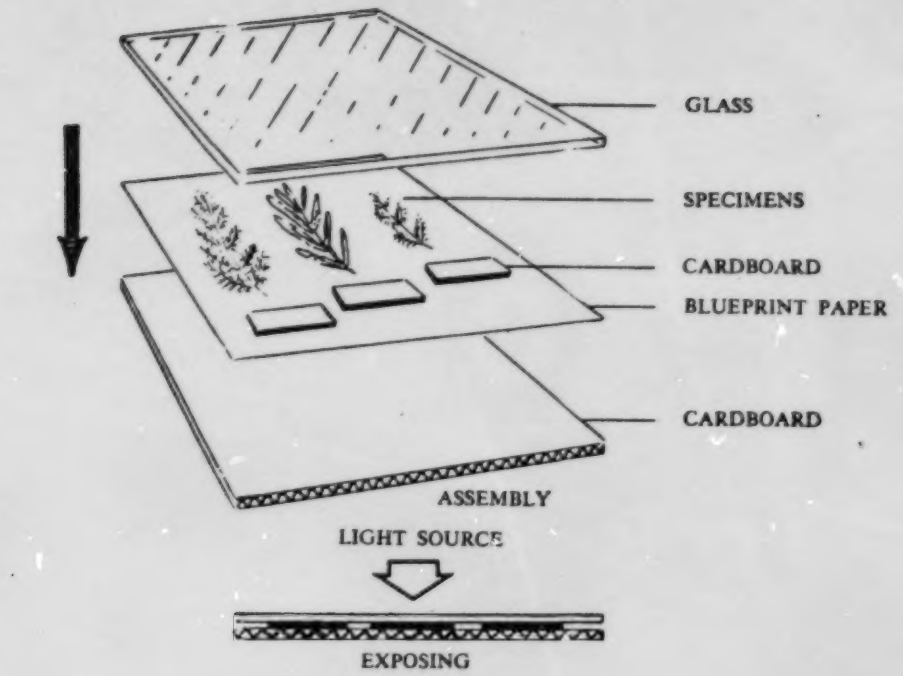
identification book, newspaper, weights, cardboard, shellac, glue, adhesive paper.

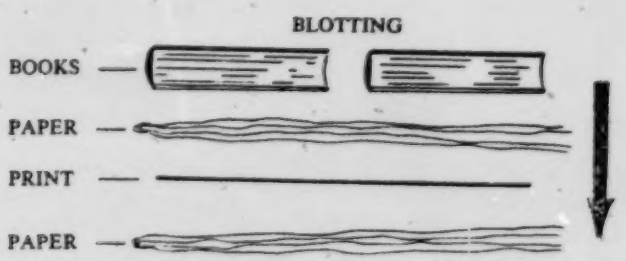
When you collect leaves, be sure to get a variety of kinds, including simple and compound leaves; alternate, opposite and whorled arrangements of leaves; leaves showing both palmate and pinnate venation; and leaves with different margins. Keep leaves from bushes separate from tree leaves so that they are easier to identify. Use a tree identification book both while you are collecting leaves and while you are sorting them to help you find what kinds of leaves you have. Take a magazine and some loose pieces of newspaper with you on your collecting hike so that you can slip the leaves between the pieces of newspaper into the magazine or carry a botanical press. Then place weights on the magazines and let the leaves dry for several days. Never dry leaves in a book. The moisture from the leaves will ruin the pages.

There are several different ways in which you might like to display the leaves you have collected. For example, you can make a display which shows how leaves change color as the weather becomes cold. For this you would collect leaves early in the fall while they are still green, then collect leaves from the same trees after they have changed color, and mount them together.

You should have a good way to mount the leaves so they can be handled and easily stored without damage. Try cutting pieces of cardboard which are large enough for one or two leaves. Cover each piece with wood-patterned adhesive paper. Glue the leaf to it and shellac the whole surface including the leaf. This hard surface will protect the leaf from damage when the cards are handled and stacked.







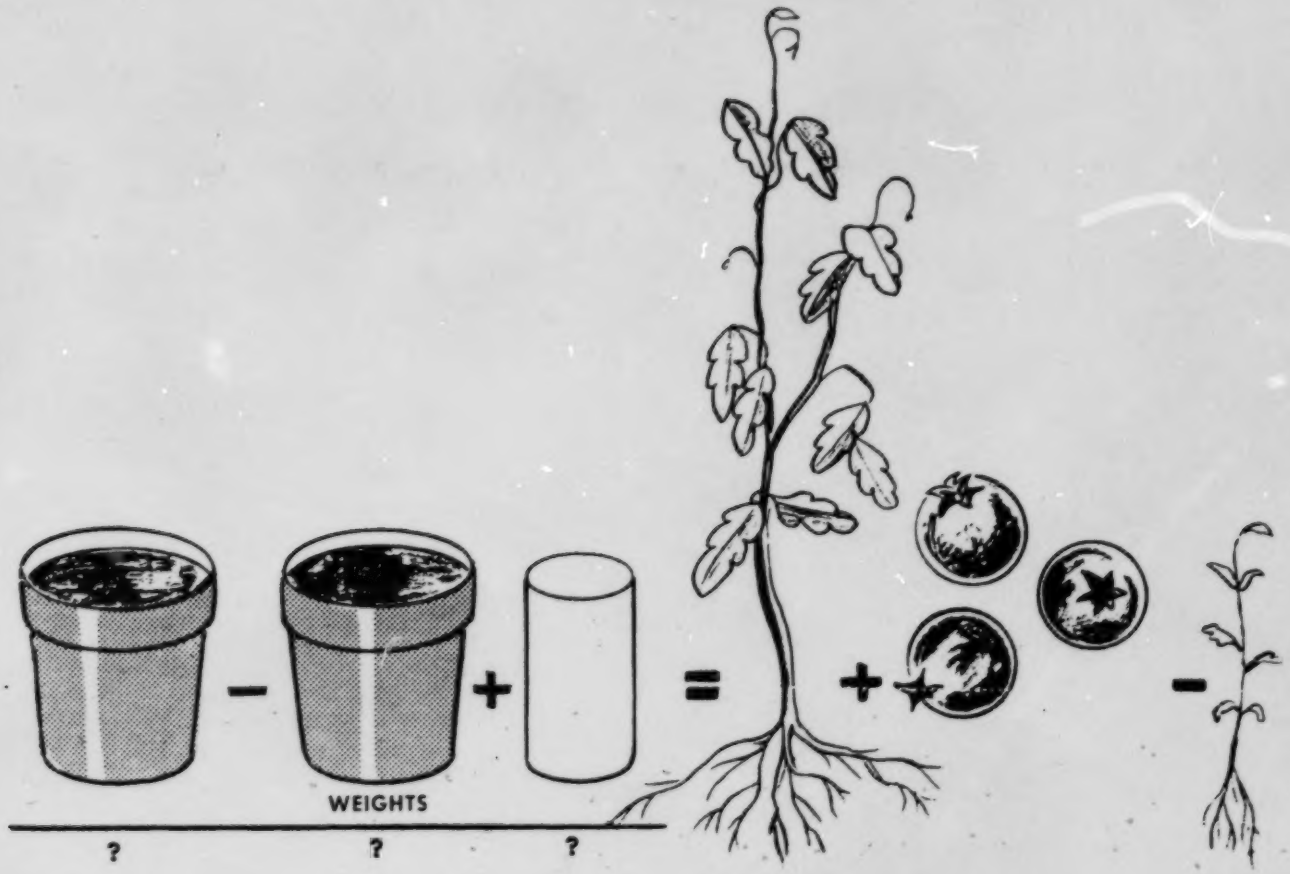
Blueprinting Specimens

Procedure

1. Cut a piece of blueprint paper to size. Don't work in direct sunlight while handling the paper until time to print the silhouette. Keep the cut pieces of paper in a large, tight Manila envelope until ready to use.
2. Place the blueprint paper on a piece of cardboard, sensitive side up. Work in the shade, or indoors until ready to expose the material to sunlight.
3. Place the specimen on the blueprint paper. Below the specimen, place a small piece of cardboard to make a name plate. Use a piece of cardboard large enough to allow for adequate space to do the desired labeling on the finished print.
4. Place a piece of glass on top of the specimen, hold it firmly in place, and place in bright sunlight. A high wattage incandescent bulb may be substituted for the sun as a light source, if necessary.
5. Allow the material to remain in the light until the blueprint paper begins to turn white. Take care not to leave the paper in the sun or under the lamp too long. Lift off the specimen and glass.
6. Develop the print by dipping it in water two or three times. Then blot the print by placing it between folded sheets of newspaper. Weight the papers with books to insure that the print will dry flat.

Follow-up activities

Children may wish to add details to the prints with water colors or another coloring medium. The finished prints should be mounted properly and labeled for identification. Comparisons of various specimens may be made in a follow-up discussion, and facts may be checked by the students involved through appropriate library research or comparison with previously prepared prints and specimens.



DETERMINING HOW MUCH SOIL A PLANT USES

Materials you'll need:
large clay pot, tomato plant, scale, pint jar

How much material does a growing plant take out of the soil before it matures and bears fruit? A scientist named Van Helmont was the first one to figure this problem out. See if you can, too. It will take careful measurements so be exact in your figures.

Put two inches of coarse gravel in the bottom of a large flower pot. Fill it almost full with good soil. Place the pot on a scale and weigh it. Record this amount in your science notebook. Take a small tomato plant and carefully remove all the soil from around its roots. Weigh the plant and record this number.

Now plant the tomato plant in the pot of soil. Pour exactly one pint of water over it. Continue to water it whenever it is dry. Each time you do, measure and record the amount of water given. When the plant is mature and produces tomatoes you may harvest your crop, recording the weight of each fruit picked. When the plant stops bearing tomatoes, dig it up and carefully shake all soil from the roots back into the pot. Weigh the pot and the soil again. What is the difference between the weight of it now and before you grew tomatoes?

Add up the weights of all fruit picked plus the weight of the plant at the end. Subtract from this number the weight of the plant before you began to experiment. How many ounces of plant were produced? How many pints of water did you give the plant? Using the figures you have, what is your conclusion about the source of the raw materials a plant uses in growth?

ACTIVITIES

FLOWERS, FRUITS, AND SEEDS

Preliminary Classroom Activities

1. *Show transparency from seed to seed to introduce this section (p. 18).
2. *Review and learn major organs of a plant (p. 19).
3. *Label and learn diagram of flower (p. 20).
4. Label and learn parts of monocot and dicot seeds (p. 21).
5. Dissect fruits (or show pictures of fruits) and identify parts in order to define fruit.(pp. 26 – 27).
6. Dissect a flower and draw parts (pp. 22 – 25).
7. +Have students collect common native flowers and seeds from their area.
8. Pass out fruits (tomatoes, cucumbers, apples, etc.) to groups of 4 – 5 and count number of seeds noting seed arrangement.
9. +Choose and use experiments on dandelion (pp. 28 – 29).
10. Test the germination of seeds (p. 30).
11. +Put old sock on foot and walk in field, then examine seeds collected.

Center Activities

1. +Identify native flowers and fruits with help of Center Director.
2. Select a tree and determine shape, bark, flowers, fruits, leaf structure (p.31).
3. Observe the pressing of plants.
4. Use microscopes to see embryo of seeds.
5. Taste sweet gum while on the trail.

Culminating Classroom Activities

1. Display plant specimens flowers, seeds and classify according to monocot and dicot, simple and compound, edible and non-edible, etc.
2. Construct chart showing pictures of fruits.

From seed to seed: how we get our fruit.

A fruit starts with a flower. If you could watch a speeded-up movie of flowers growing, you'd see some surprising things. You would see a flower bud get larger. Soon it would burst open. And look! A beautiful flower.

Flowers, as you have learned, come in all different sizes, shapes, and colors. But there is one thing that makes flowers alike. If you watch a flower dying, you would see the petals droop and dry up. But look again and you'd see something in the flower that is still growing. At the bottom of the flower, the ovary keeps growing. The larger, showy parts of the flower drop off the plant. But the small ovary keeps getting larger until it becomes something we know. The ovary grows into a fruit!

If the flower is on an apple tree, we call the ripe ovary an apple. On a tomato plant, the ripe ovary becomes a tomato. Many plants get their names from the kind of fruit they grow.

FOR FURTHER INVESTIGATION

1. Make a chart showing different kinds of wild fruit growing near your home. Which are safe to eat?

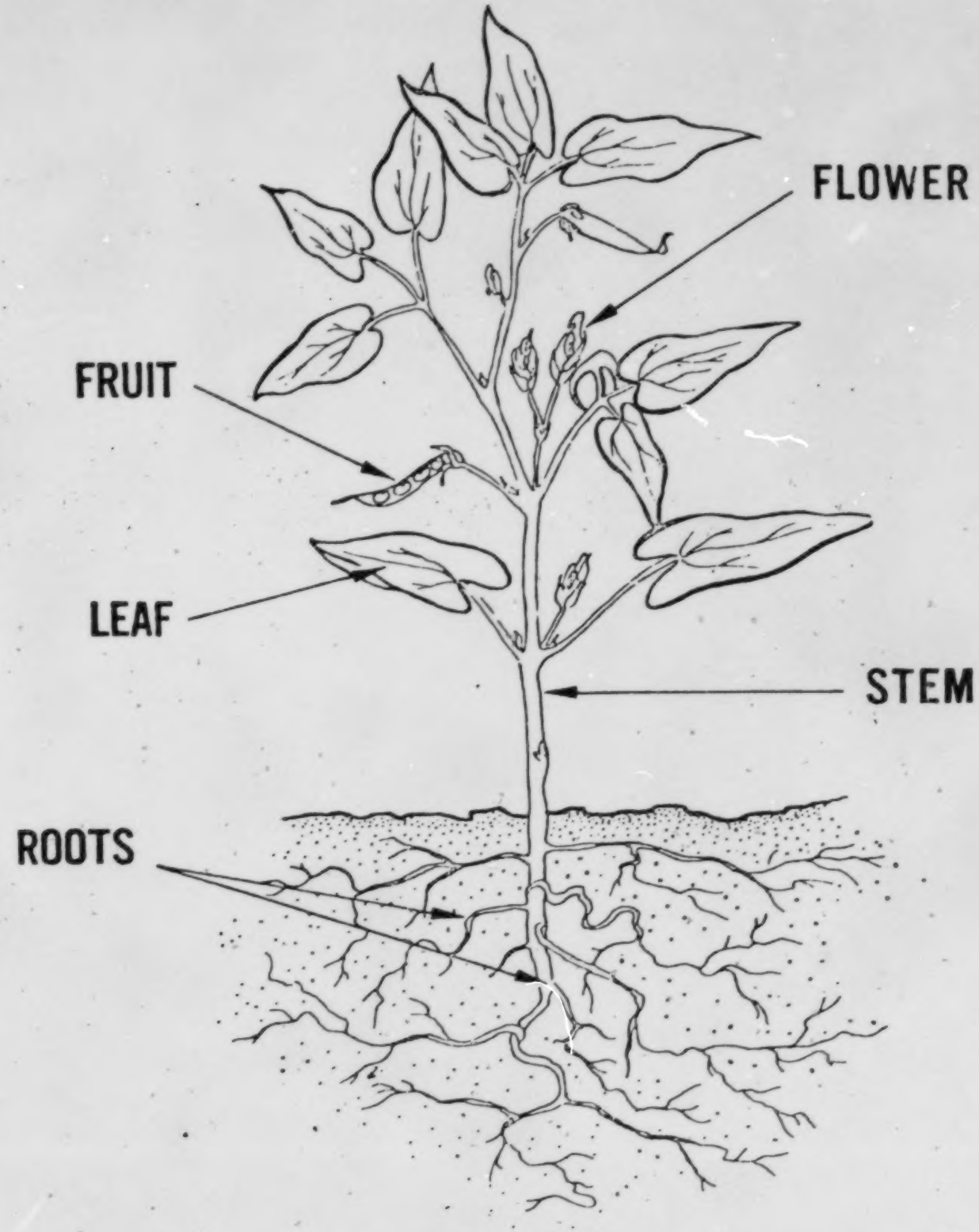
2. Take a gladiolus flower. Study the parts of the flower. Where is the fruit?

3. Make a study of the different ways seeds are placed in different kinds of fruit.

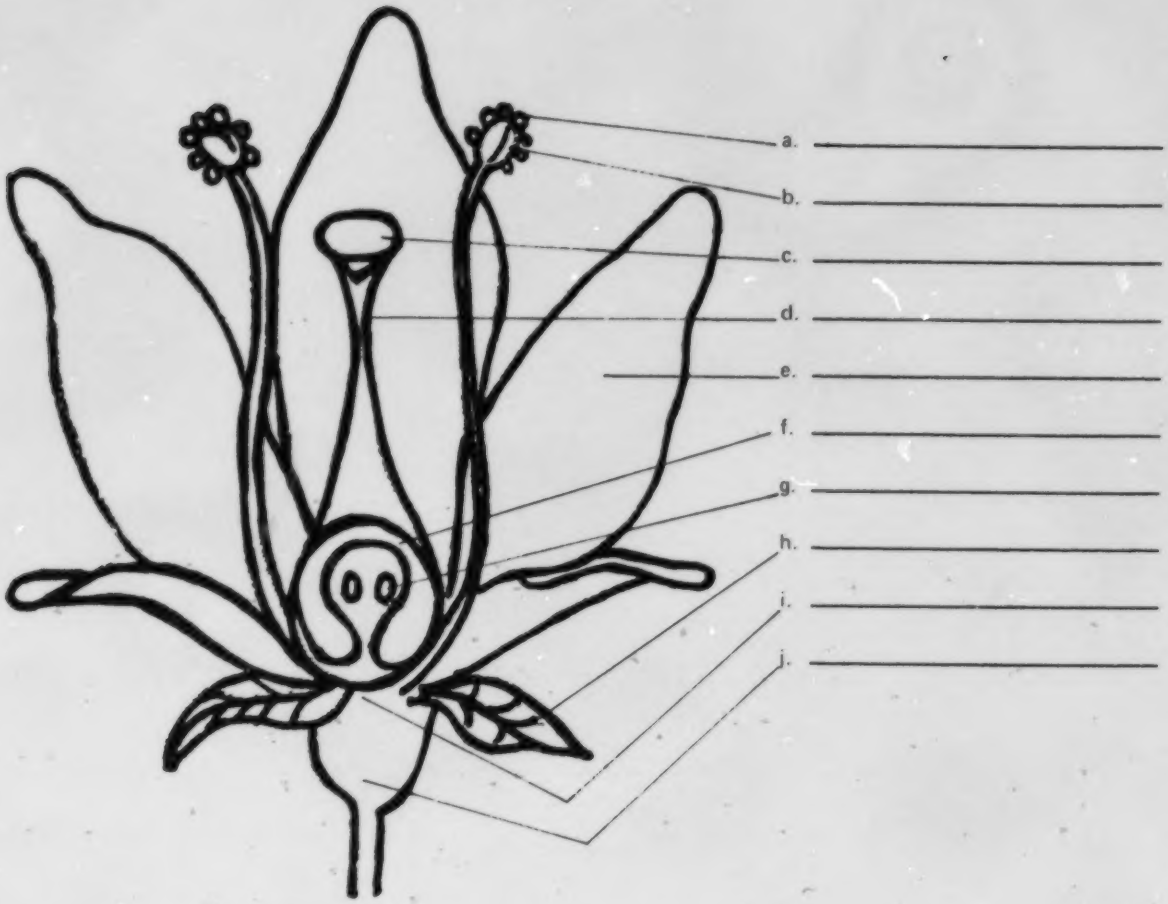
WHAT'S NEXT . . .

In apples, tomatoes, and peas, the seed is inside the fruit. In a strawberry, the seeds are the tiny, sand-like pieces on the outside. Are seeds only something to eat or throw away?

MAJOR ORGANS OF A PLANT



IDENTIFY AND LABEL THE PARTS



Cross - section of a flower

a. pollen

b. anther

c. stigma

d. style

e. petal

f. ovary

g. egg

h. sepal

i. receptacle

j. peduncle

26

LEARNING ABOUT MONOCOTS AND DICOTS

	STEMS	NUMBER OF PETALS	KINDS OF LEAVES
MONOCOT FLOWERS			
DICOT FLOWERS			

See Heath text, pp. 244 – 247.

1. The part of the seed where food is stored is called the c _____. Seeds with two food parts are called d _____ or dicots for short. Seeds with one food part are called m _____ or monocots for short.
2. Select an example of a monocot and a dicot. Draw the stem structure, number of petals and the appearance of the veins.

INTRODUCTION

Rose, tulip, carnation, daisy, marigold, poppy.

Flowers are what's happening. You see them pasted all over some cars. Hippics wore them in their hair. Some men put a flower in a buttonhole in their jacket. Some women have them in their hats.

People give flowers for birthdays, Mother's Day, proms. You see them sold on street corners. You look at them – you smell them. Some people sneeze over them. But others put them in water in a jar and set them on a table in the kitchen or living room. Some people like real flowers. Others like only the plastic, fake ones – they last longer.

INVESTIGATION

What are flowers?

MATERIALS

magnifying glass
forceps
scalpel
paper towels
common flower

PROCEDURE

Look closely at a real flower. Study it but do not take it apart yet.

Make a simple drawing of your flower, and name all the parts you know.

Flowers don't often grow on streets with apartment buildings. But many windows in those buildings have flower boxes on the window sills.

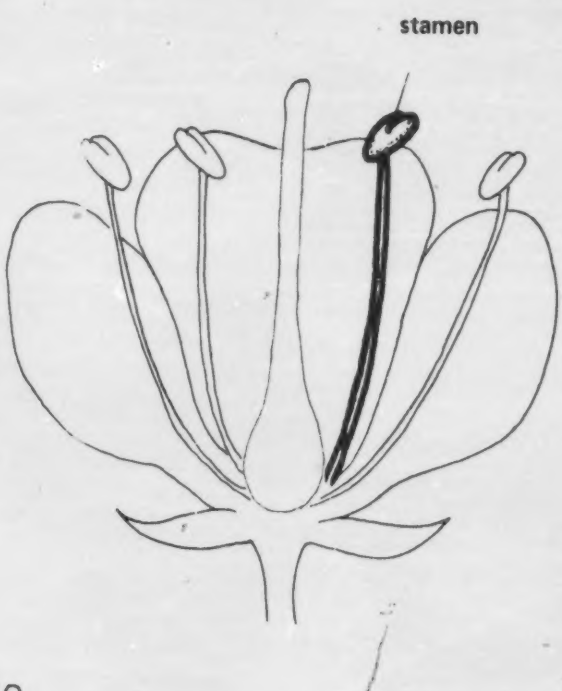
Do you have a favorite flower?

A flower is a thing of beauty. Are there any flowers growing in or around your home and school? (If not, perhaps you can plant some seeds, which you can get in a five-and-dime store, or bring in some flowers.)

The next time you go by a garden or a flower shop, take a close look at what's growing or what's in the window.

A flower is only one part of a plant. But it is a very important part – the reproductive organs. Some types of plants have the male organ in one flower and the female organ in another flower. Other types of plants have both the male and female parts in the same flower.

The male organ in a flower is called the stamen (STAY-men). It looks something like this:



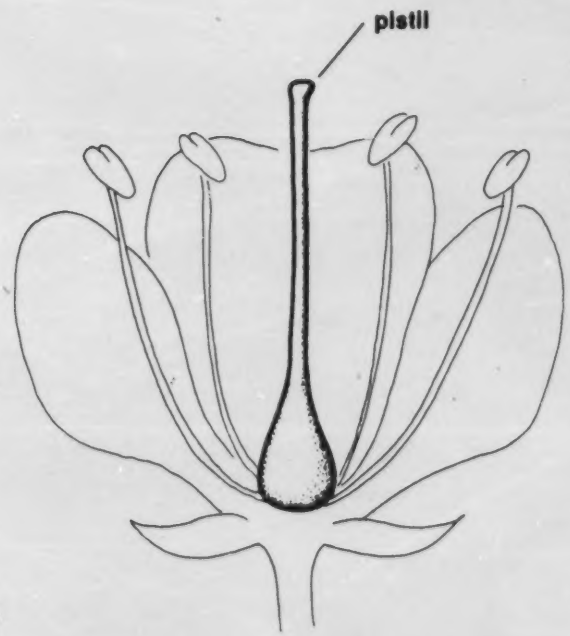
How many stamens does your flower have?

_____

After you have counted the stamens in your own flower, look at one carefully. Now draw it.

The stamen make a dust-like material called pollen. In the pollen are the male sperm cells.

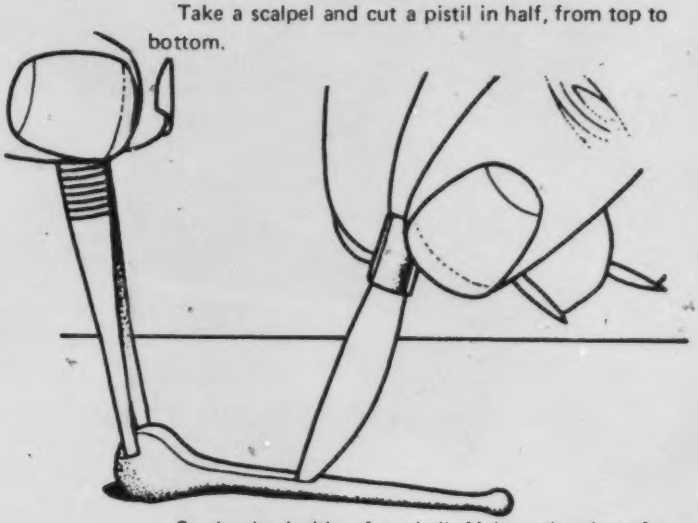
The female organ of a flower is the pistil. Here's what it looks like:



How many pistils does your flower have? (You may have to take away the petals and stamens to get your answer.)

_____

Take a scalpel and cut a pistil in half, from top to bottom.



Study the inside of a pistil. Make a drawing of a cross section of a pistil.

What does the bottom part of the pistil look like?

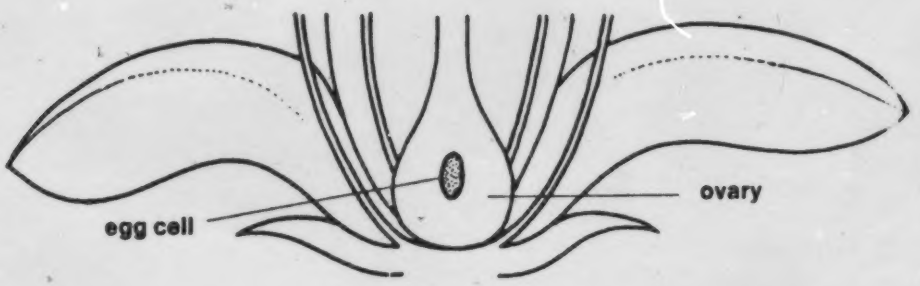
_____

_____

_____

The round object at the bottom of the pistil is an ovary (OH-vah-ree). The ovary holds the flower's egg cells.

When the (male) sperm cell in the pollen joins with one of the (female) egg cells in the ovary, a seed will grow.



The sperm fertilizes (FER-ti-leyes-es) the egg to make a seed grow. But first the pollen must be brought to the female organ.

Wind, water, and insects carry pollen from the stamen to the pistil. That is, wind, water, and insects help pollinate (POL-i-nate) a flower.

By the way, there is a reason why flowers smell good. The smell attracts insects to the flower. The insects feed on the sweet juices of the flowers. But as they go from one flower to the next, the insects pick up pollen from one flower and take it to the next.

To sum up the last two pictures: First there must be pollination (bringing of pollen from stamen to pistil). Then there is fertilization (joining of sperm and egg).

Once again, go back to your flower. You've taken most of the flower apart. Can you draw a whole flower and name all the parts you now know? (Don't forget the stem.) You can then compare this drawing to the first one you made.

SUMMARY

1.Why is the flower really an organ of reproduction?

_____

_____

_____

2. Some flowers are both "male"and "female." Is this kind better than a flower that has male parts in one flower and female parts in another? Why or why not?

_____

_____

_____

_____

3. What do you think petals do for a flower?

_____

_____

_____

4.What can we do to help more flowers bloom in the city?

_____

_____

_____

_____

_____

FOR FURTHER INVESTIGATION

1.Make drawings on a chart showing the shapes of different flowers.

2. Plant seeds near your home or school to have a supply of colorful flowers throughout the year. Seeds can be planted in flower pots, in a greenhouse, or outside in a field.

WHAT'S NEXT . . . .

So, there's a lot more to a flower than beauty. Take a fruit. You may be eating more fruit than you think. And what has a fruit got to do with a flower, anyway?

INTRODUCTION

You're sent out to do some shopping. You grumble about it, but you go. On the shopping list are fruits and vegetables. They are fresher in that little store that sells only fruits and vegetables. But the prices are cheaper in the supermarket.

You look over the oranges first and then the

apples	tomatoes	melons
peaches	eggplants	stringbeans
strawberries	cucumbers	bananas
squash	corn	blueberries

and finally the peas.

So many colors and shapes.

Your shopping list says "fruits and vegetables." But which of these foods are fruits? Which are vegetables?

INVESTIGATION

What is a fruit?

MATERIALS

magnifying glass
forceps
scalpel
pea pods
fresh fruit
whole tomato

PROCEDURE

A. Pea pod

How do you like your peas – cooked, raw, or in soup?

You buy a pound. When you get home, you open up the bag. What's inside doesn't look anything like the peas you get in a can. You find in the bag long green things, which come from the fields. These are pea pods. You will begin this study with them.

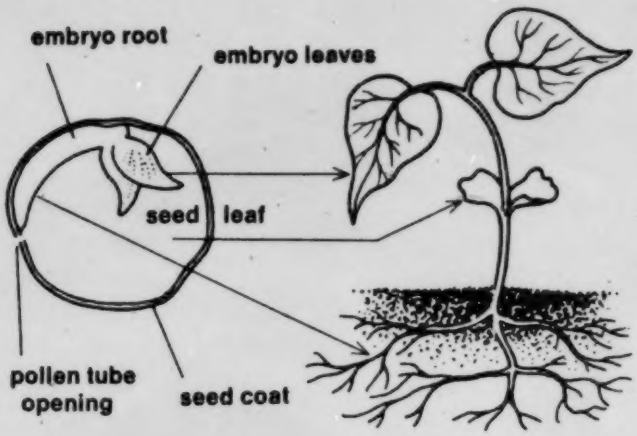
Look closely at the shape of a pod. Draw a side of the pod, as you see it.

Open the pea pod along the middle line. The seeds are attached to the wall of the pod. What do we call these seeds?

Study how peas are placed inside and how they are attached to the pod. Draw the open pod.

Take one of the peas and look at it with the magnifying glass. Make a drawing of the seed, showing where it was attached to the pea pod.

Each part of the pea (the seed) grows into a different part of a new pea plant. Here is a picture showing a growing pea seed and the parts of the new plant that grow from the seed.



The pea, which is a seed, will grow into a plant.

B. Tomato

When tomatoes are not ripe, they are green. Then they turn a juicy red. Now they may be sliced into a hero (or do you call it a submarine?), or bitten into whole, or cooked. When tomatoes are overripe, they become too soft.

Green, red, or oversoft, tomatoes are also for studying.

Begin with a whole tomato. Notice where the stem of the tomato was attached to the plant.

Slice the tomato in half. Be careful that the juice doesn't squirt in your eye.

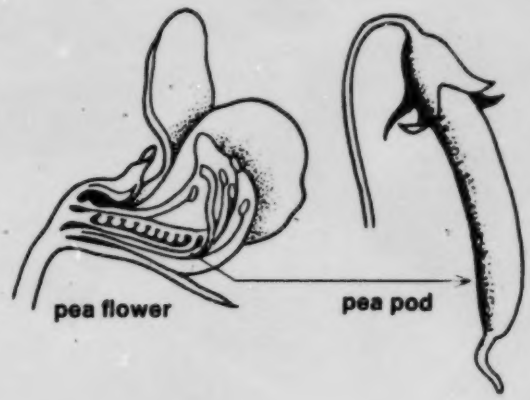
Make a drawing of the tomato as it looks cut in half. Show the seeds and the outside covering of the tomato.

How are the pea and tomato like the peach and apple?

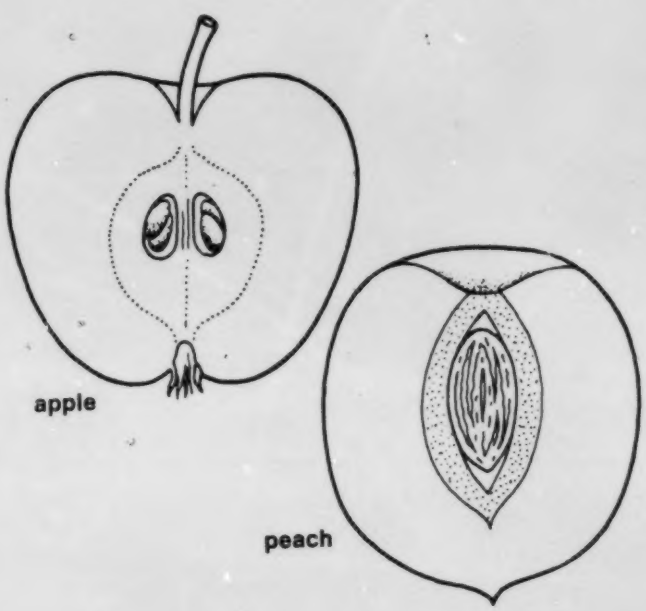
Now can you answer: What makes a food a fruit?

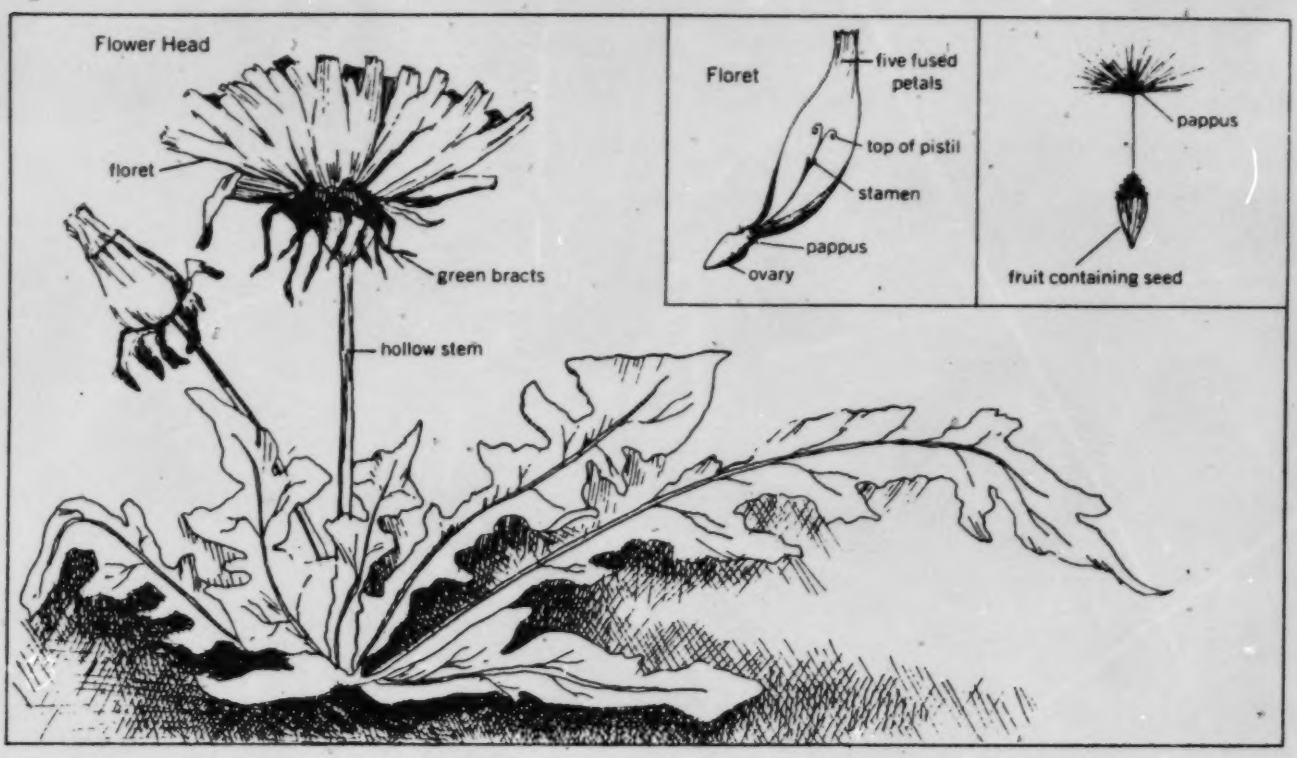
The flowers of the pea plant will make pods.

From your study, what do peas and tomatoes have in common?



Up to now, you might have been calling the peas and the tomatoes vegetables. Now take a look at the two diagrams below. You know them to be two kinds of fruit. Get some of these fruits, cut them open and study them. When you finish looking them over, from outside to inside, there are two questions for you.





Although common weeds, dandelions add beauty to fields and wastelands in the spring. Even in the inner city, dandelions can usually be found on school grounds. They may be in a patch of grass, growing in a crack in the sidewalk, or against a building. They can also be frequently found in areas between the sidewalk and the curb.

The leaves of the dandelion plant are unusual. While the leaf points and serrations of most plants slant toward the tip, the points on the toothed leaves of dandelion plants slant toward the ground. Because of this leaf shape, the French named the plant dent de lion, meaning "lion's tooth," and from this came the English dandelion. (And therein lies a lesson in word derivation. Editor)

The flowers, too, are interesting, for each flower head is a cluster of flowers like a bride's bouquet. (See the diagram above.) When the green bracts (like the white lace doily of a bride's bouquet) are removed, the individual yellow flowers fall apart. At the base of each flower, a pale green or white seed can be seen developing.

Ripe seeds are interesting not only because of their parachutes that carry them over the countryside on windy days, but also because of the sculpturing and ridges on the seed itself. Performing the same function as does the thread of a screw, the sculpturing and ridges help carry the seed down into the ground. If you pull one dandelion floret out of the flower head, you will see the ovary, which will grow into the sculptured coating on the outside of the seed, and a pappus, which grows into the parachute.

Dandelions produce huge numbers of "bouquets." In the spring, you can find on every plant fresh blooms, an abundance of unopened flower buds, and dead flower heads that contain ripening seeds. The buds range in size from large ones ready to pop open to tiny green knobs buried in the center of the plant.

The hollow stem is another unusual characteristic of the dandelion plant. It provides a flexibility that enables the flower to bow to adverse conditions rather than break. The heavy taproot and the fact that the plant is a perennial are other parts of the success story of dandelions.

DANDELIONS

Experiment:

a. Establish the number of seeds in a seed cluster.
b. Blow the seeds onto a moist sheet of paper and observe.
c. Draw a ripe dandelion seed.
d. Observe the flight path of a seed with and without its umbrella or parachute.

Answer:

One flower-head has about 120 flying seeds. Even the gentlest breeze catches the hairy crown of the seed and carries it for quite some distance. With the little hooks which are part of the seed, it anchors itself into the soil.

Seeds without umbrellas fall directly to the ground, while seeds with umbrellas are parachuted and carried away by the wind.

Experiment:

a. Examine the construction of the stem or shaft of the blossom.
b. Split a shaft lengthwise and place it in water. Watch what happens.
c. Observe the milky fluid which can be found in the dandelion.

Answer:

The shaft is hollow, round, and completely without leaves. The shafts are also quite different in length from plant to plant. It is quite elastic and, due to the lack of leaves, can easily be bent by the wind. Each shaft grows as high as necessary for the blossom to get full sunlight. This difference of height makes seed dissemination by the wind easier.

A split shaft will roll up when placed in water, since the cells which make up the inside wall will swell with the sudden taking up of water.

The milky substance protects the plant against the danger of being eaten by small creatures because it is quite sticky. Small animals (snails, caterpillars, and the like) will become sticky when biting into the plant – and will often be trapped. The substance is so sticky, that an ant can become glued to either the stem or a leaf of the plant and die. This is why most insects aviod the dandelion. On human skin, the milky substance leaves a brown stain.

Experiment:

Explain what mankind thinks of the dandelion.

Answer:

To those who love and admire flowers and plants of any kind, dandelions appear beautiful and artistic- as well as functional.

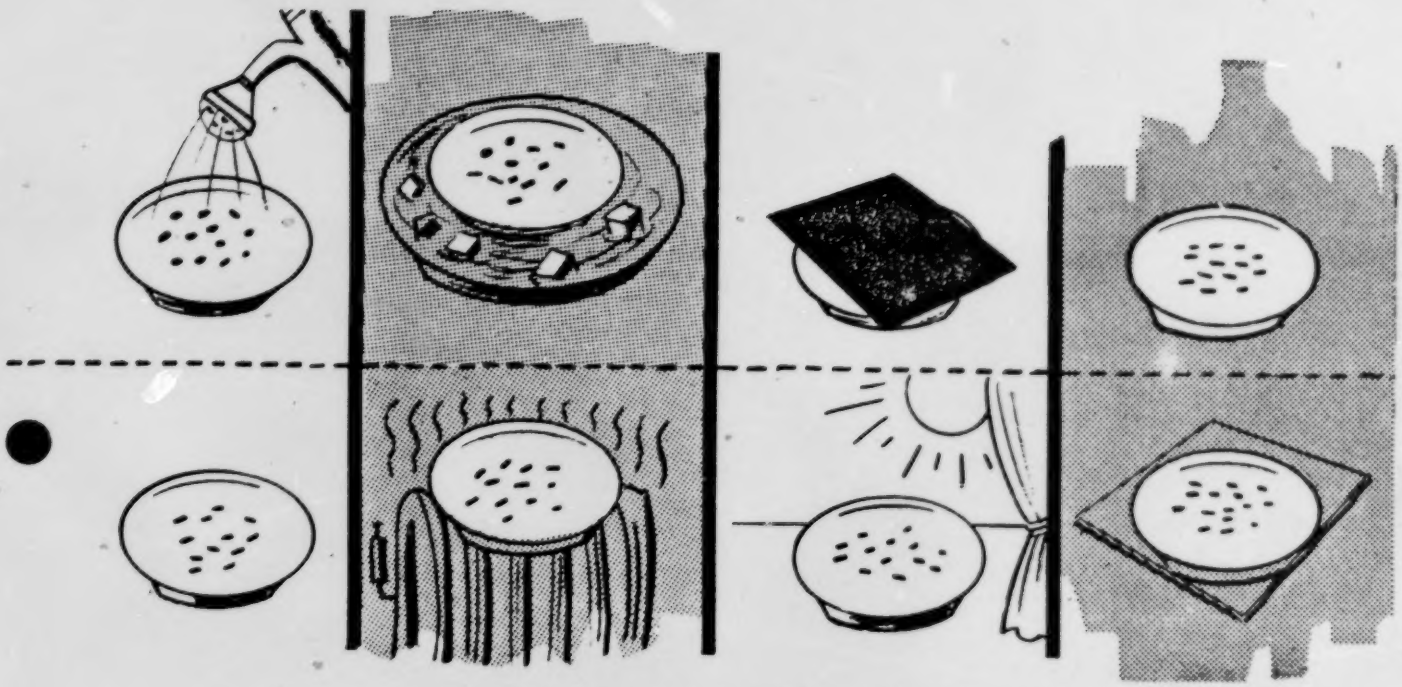
The young leaves of the dandelion make a very tasty and healthy salad. The plant contains salts, which are of great aid to the human organism and help keep our body healthy. Dandelion plants have medicinal value. Medicine to prevent the thickening of the blood may be made from the leaves and roots. Eating fresh dandelion stems is said to help prevent liver infection.

Its roots, like those of the chicory plants, are sometimes dried, roasted, ground, and mixed with coffee. Often these ground roots are even used as a coffee substitute. Because of this, dandelion plants are cultivated to a certain extent, and a number of improved varieties have been developed.

Yet, when too many dandelion plants grow in a meadow, field, or garden, they are quite harmful to the rest of the plants which grow there. Therefore farmers and gardeners see the dandelion as only a weed.

Weed: Gardeners and farmers classify all plants which are not desirable as weeds. Such plants are harmful to the existence of other plants in one way or another.

Biologists or botanists do not recognize the word weed. For them, there exist only plants and flowers of different origin, type, form, action, and worth. On this principle our modern agricultural botany is built.



TESTING THE GERMINATION OF SEEDS

Materials you'll need:

variety of seeds, 8 saucers, 2 pieces of glass, cotton, rectangular cake pan

Decide upon one kind of seed to use for all experiments. You will test the effects of four different factors on germination: temperature, amount of light, water, and oxygen. When testing one factor it is important to remember to keep the other three factors the same.

Place a blotter or layer of absorbent cotton in the bottom of each of eight dishes. Put a dozen seeds on top. Use two dishes for each of the four factors. One dish will be the experimental one while the other is the control.

Water test: Water seeds in dish number 1, but do not water dish number 2;

Temperature test: Keep seeds number 3 in a pan of ice water and seeds number 4 in a warm place;

Light test: Put seeds number 5 in a dark cupboard and seeds number 6 in a sunny window;

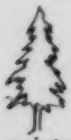
Air test: Leave seeds number 7 open to the air but put a sheet of glass or clear plastic over seeds number 8.

Observe the rate of germination daily. What happens to each pair? Do seeds grow better in warm or cold places, in light or dark, with or without moisture and air? Record your results.

Now that you have found out the best conditions for germination, test the rate of germination with a variety of different seeds, such as radish, corn, bean, sunflower, grass, apple, and acorn. Soak all the seeds overnight to help loosen their seed coats. Make a long glass sandwich with a cotton layer between. Place seeds in a row along one side of the cotton. Tie the sandwich together and stand it upright in a cake pan of water. Watch it daily for the first signs of germination. Which seeds sprouted first? Which ones took the longest time?

TO NAME A TREE

We look at its shape . . .


pointed

spreading

bending

stout

slender

We look at its bark . . .

smooth

ridged

scaly

peeling

We look at its flowers and fruits

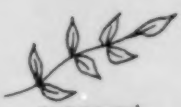
We look at its leaf to see whether it is a simple leaf or composed of several

leaves called leaflets attached to a single stem..

We look at the veins of the leaf and we look at the edge of the leaf.

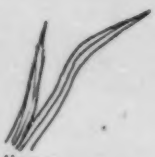
simple

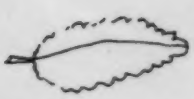
or


compound

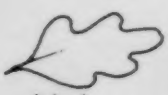
palmate,

pinnate,


linear


serrated,

smooth,


lobed

dicots

monocots

ACTIVITIES
PLANT REPRODUCTION

Preliminary Classroom Activities

1. Read and discuss "Louisiana Land and its Bounty" to emphasize importance of soil and plants.
2. Dissect pea pod, draw inside and locate embryo (pp. 33 – 35).
3. Discover how plants react (tropisms) (pp. 36 – 37).
4. Experiment to see if plants move toward light (pp. 38 – 39).
5. Set up experiment to see how plants react to laws of gravity (p. 37).
6. Grow two generations of ferns (p. 40).
7. Examine different kinds of pollen to determine differences (p. 41).
8. Set up various types of terrariums (p. 42).

Center Activities

1. Observe examples of dormancy and germination .
2. Note and determine why plants grow in some areas and not in others .
3. Observe soil contents in various areas of the trail and note how plants hold soil in place .

Culminating Classroom Activities

1. Group students and let them set up new growth from various methods (leaf cuttings, stems, roots, bulbs, seeds, parts of vegetables) (pp. 43 – 44).
2. Compare cactus terrarium with wet terrarium; measure amounts of water needed by each.
3. Grow plants and have control groups and experimental groups (pp. 38 – 39).

INTRODUCTION

You take an orange from the refrigerator. You slice it in half, or maybe peel it. And bite in. Uggh. Your teeth have sunk into a seed (or pit, as some people call it.) So you spit it out. Do you know what you're spitting out?

All life has a beginning. Plants, too, have a beginning. They also have an end – death. But for now, you will be looking at beginnings. How do plants begin their life?

The green plants – flowering plants and trees – have their beginning in seeds. You will remember that flowers are the organs of reproduction in plants. Pollination and then fertilization take place in the flower. When the flower dies, fertilized seeds in the ovary remain to carry on life.

When the ovary becomes a fruit, the fruit will after a time become ripe. Once ripe, it will drop from the plant or tree. On the ground, the fruit will rot and the seeds will be left. Wind and rain may cover the seeds with soil. The seeds are now ready to grow into a new plant. They are planted and will begin to grow without the help of man.

In many flowers, the ovary does not become a fruit as you usually know it. This ovary will break open when ripe. The (fertilized) seeds will either drop out or be blown to the ground by the wind. They, too, may then become planted. Many kinds of plant seeds must rest for some time before they can grow into a new plant. Some must also remain dry for weeks or months before they can be planted.

The baby plant, called the embryo (EM-bree-oh), lies inside the seed. Inside the embryo's cells is a kind of "blueprint" or "plan" for what the plant will be. This "blueprint" is actually in the form of a very complicated chemical. The differences between two plants come from the difference in the chemical found in the cells of the embryo. This plan was set down at the time of fertilization.

Our own "plan" for how we grow was also set down at the time of fertilization. That is, at the time when the father's sperm cell joined with the mother's egg cell.

In this investigation you will be seeing and studying the parts of a plant seed.

INVESTIGATION

What is a seed?

MATERIALS

fresh pea pod
large dried lima beans
magnifying glass
watermelon seeds
iodine
scalpel
test tube

PROCEDURE

A. The pea, seed

Seeds are interesting bits of plants. They give the embryo, or baby plant, the materials to grow into a new plant. The embryo needs moisture and air. These materials enter through the seed coat, which is the hard outside covering. The seed holds not only the embryo itself but also food for the embryo.

The seeds of different plants grow differently. Bean and pea seeds, for example, are found within a pod.

As you did before, open a pea pod along one edge. Notice the way the pea seeds are attached to the pod. Take out one of the pea seeds and examine it. What is the evidence that the pea was attached to the pod?

_____

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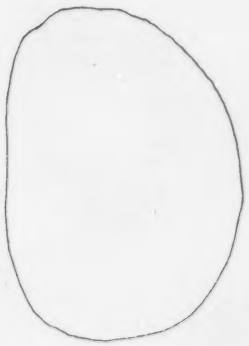
_____

Look at the seed through a magnifying glass. You should notice two things: one is a scar or "seam"; the other is a tiny hole on one edge of the scar. This hole is the pollen tube opening. It is where the male sperm cell entered to join with the female egg cell.

Here are the main parts of a seed.

Using your fingernail, or your scalpel, gently cut into the outer curve of the seed. Carefully tear open the two halves of the pea. Try not to pull them apart or destroy the seed coat. Look at the inside of the seed with a magnifying glass.

Here is an outline drawing of the inside of a pea seed. Draw in the details as you see them in the real seed.



The baby or embryo plant is attached to one of the seed halves. It will grow into a new plant when the seed is planted in the ground.

The seed coat around the pea seed is soft. The pod helps protect the seed. But many seeds need a very hard seed coat because there is nothing else to protect them. You are probably more familiar with seeds with hard coats - like the apple, peach, squash, and watermelon seeds.

Take a watermelon seed. Look at it carefully with a magnifying glass. Which parts of this seed can you find?

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_____

If you cannot find all the parts you saw on the pea seed, there is a reason. The hard seed coat covers them. This hard coat grows around after the seed is fertilized. It even covers up the pollen tube opening.

What shape is the watermelon seed?

_____

_____

What size is it?

_____

You now see that seeds come in all kinds of sizes and shapes. And the parts of a seed are not all seen in the same place on different kinds of seeds.

It is difficult to open a watermelon seed. If you could cut it open, what would you expect to find inside?

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_____

_____

What do you think would happen if you planted this seed?

_____

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_____

Plant it and find out.

C. The lima bean seed

Another seed whose parts and embryo are easy to see is the lima bean seed. Lima bean seeds should be soaked for at least one day before you study them. This will make them soft for easier study.

Study the lima bean seed in the same way you did the pea seed. The large seed halves hold food for the embryo plant. You can test the lima bean halves with Lugol's solution in a test tube. What nutrients (NOO-tree-yents) are held in the seed halves? (Nutrients, which are necessary for the life of all living things, are these common chemicals: carbohydrates (starches and sugars); vitamins; fats; minerals; proteins; water.) Place a few drops of iodine on the seed. Does it turn a blue-black color? If it does, then the lima bean has starch in it. Does yours?

SUMMARY

1. What is a seed?

_____

_____

_____

2. What part of the seed will grow into a new plant?

_____

_____

_____

3. How do flowers help to make more plants?

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4. What do the large seed halves of a lima bean do?

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5. What did iodine test for?

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FOR FURTHER INVESTIGATION

1. Plant seeds of different plants and compare the young plants.
2. What happens when the seed halves are taken from a young plant? (The seed halves in a plant are the first set of leaves above the ground.)
3. Compare a corn seed to a lima bean seed.
4. Study the growth of seeds by making a vest-pocket garden.

Plants grow from fertilized eggs, just as you do. To stay alive you need food to eat and air to breathe. Did you ever see a plant eat? Did you ever see one breathe; Sure you did.

12

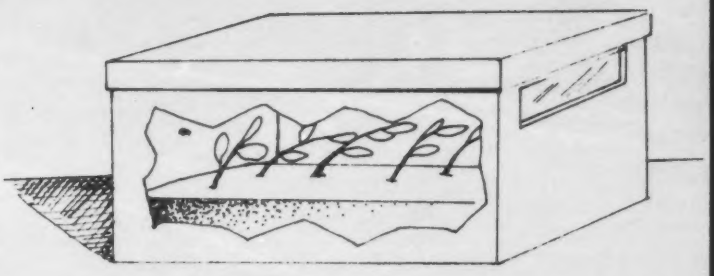
DISCOVERING HOW PLANTS REACT

Materials you'll need:

2 pieces of glass, cotton, glass planter, soil, variety of seeds, clay pot, wooden stakes, shoe box, copper wire

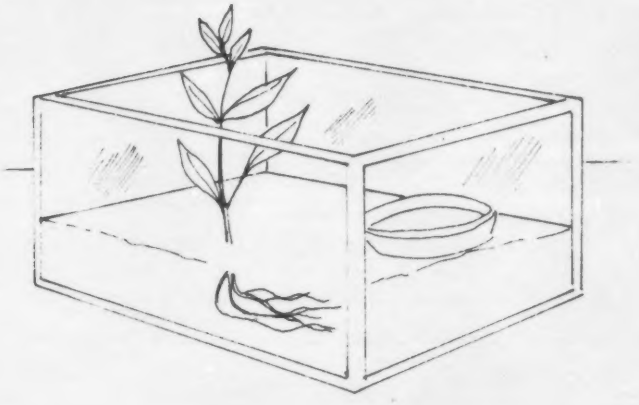
Unlike most animals, plants have only limited movement. They react toward their environment when different parts of the plants turn toward or away from a stimulus. This stimulus can be light, water, gravity, touch, or chemicals, Try these experiments on plants to test their ability to move. Have patience-don't expect a reaction in minutes. Some tropisms take hours to be noticeable.

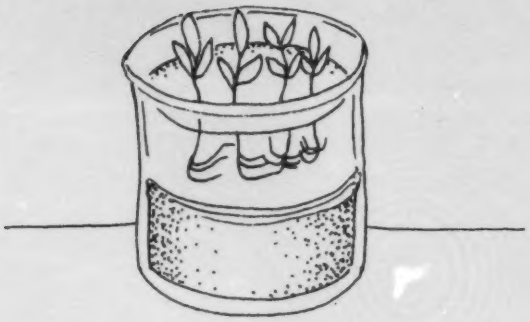
Thigmotropism: Plant some seeds of sweet pea, clematis, or garden peas in a clay pot or directly in the garden soil if it is spring. As the plant matures, drive thin wooden stakes in the ground next to the stem of each plant. Observe the action of the stem or tendrils as they reach for the stake. This is called thigmotropism and is caused by a touch stimulus (thigmo means "touch").



Phototropism: Line a shoe box with metal foil to make it waterproof. Cut the top one inch off one end of the box. Fill the bottom with a layer of gravel and cover this with good soil until the box is half full. Plant a variety of seeds: corn, bean, radish, and grass. Water the seeds well. Place the cover of the shoe box on and remove it only to water the young seedlings as they grow. After two weeks remove the cover and note the position of the tiny plants. Which direction are they leaning? What are they reaching for? This reaction is called phototropism.

Hydrotropism: Find an old aquarium or similar container for this experiment. Partly fill it with good soil. Plant seeds along the glass side at one end of the planter. At the opposite end bury a clay pot to within an inch of its top rim. Always water the plants by pouring the water into the flower pot and not on the soil at the end where the seeds are planted. Cover the sides of the planter with dark paper for several weeks. Then periodically observe the root growth of the seedlings. What are they turning for? This reaction is called hydrotropism.

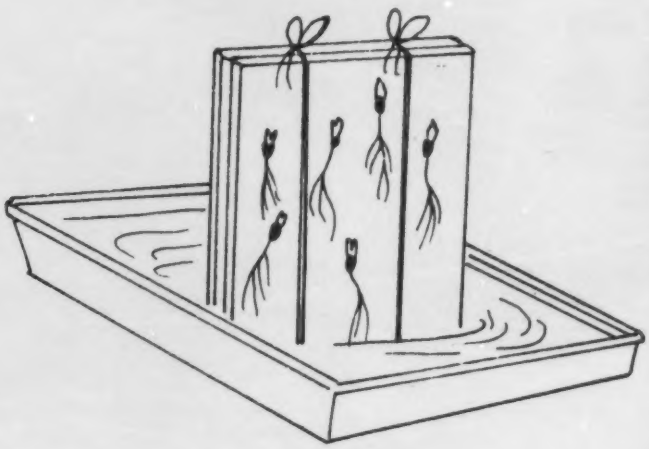




Chemotropism: Fill a jar half full of soil. Now place a ring of copper wire around the inside of the jar so that it touches the glass. Finish filling with soil. Plant several seeds next to the glass. Cover the outside of the jar so that light cannot get in. Water the seeds well. Every week observe the roots growing straight down because of the geotropism. What happens, though, when the tips of the roots are near the copper wire? This reaction is called chemotropism.

Geotropism: Put a layer of cotton on a piece of glass. Place several seeds in a row across the center of the cotton. Corn, bean, and radish seeds will germinate quickly. Put a second piece of glass over the seeds and cotton, thus making a sandwich. Tie the glass together and set it on end in a pan of water. In two or three days the small seedlings will appear. In which direction are the roots growing? After the first week turn the glass sandwich around so the top edge is immersed in the water. Notice the roots are pointing up and the little shoot downward. After a week in this position, which part of the plant is growing down toward the center of the earth?

Make another glass sandwich as described above. Select one kind of seed, such as sunflower seeds. Place three seeds with the pointed end up, three with the rounded end up, and three of them on their sides. Observe the direction of growth of each tiny plant as it germinates. Can you see a pattern? Why does this occur? These reactions are called geotropisms.



HOW DO PLANTS REACT TO GRAVITY?

Rasie seedlings in drinking glasses lined with moist paper towels. When the seedlings are about two inches high, hang the glasses in different positions. Keep a record of the responses of the seedlings stem.

INTRODUCTION

Are there any plants growing in your house or apartment? Do you have friends or relatives who like to keep plants and flowers? If you, or they, have some, chances are these plants are on a window sill. Are they are on a table near a window. Anyway, it's a good bet you would not find them in some dark corner.

People seem to put flowers and plants near a window without thinking about it. They may not know that a green plant needs the sunlight to make its food. They just "know" that it has to get light.

Suppose you needed sunlight to live, as a plant does. If you were stuck in a dark corner of a room, how would you get sunlight?

Easy. You would pick yourself up and walk over to a sunny window, That's how you would get sunlight. But if a green plant were in the shade, what can it do? It cannot move to a sunny window to get the light it needs.

Or can it?

INVESTIGATION

Do plants move toward light?

MATERIALS

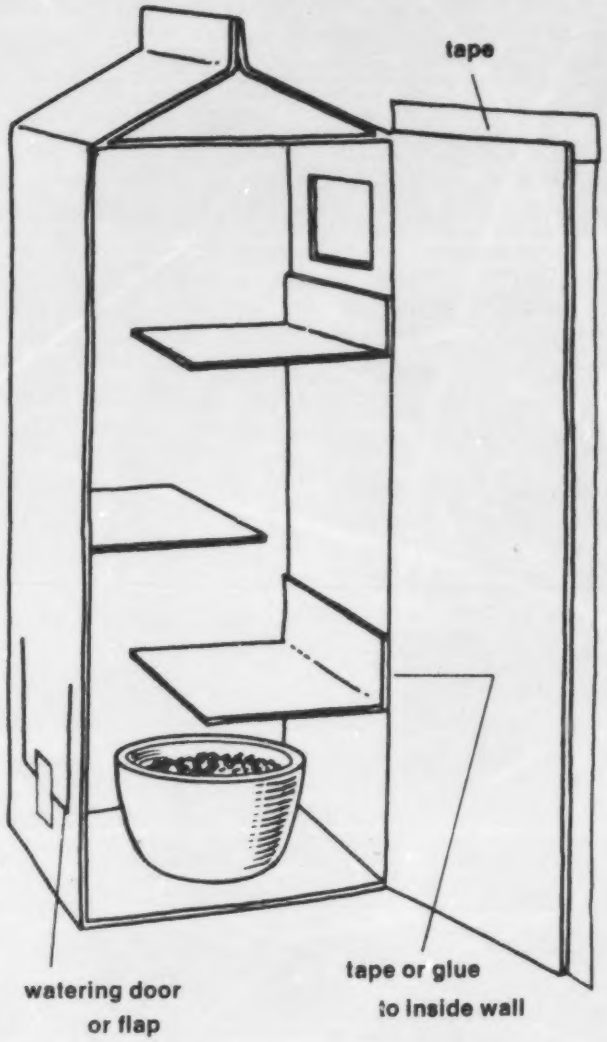
two young lima bean plants or seedlings
quart-size cardboard container (like milk or juice container)
scissors
three cardboard strips
masking tape
rubber tube (12 inches long)

PROCEDURE

Young plants are called seedlings. You will use two lima bean seedlings in this study because these seedlings grow quickly. You won't have to wait months to see if anything is happening. Use some of the seedlings from the seed investigation.

Place one of the young plants by a sunny window. Water it every day. The second seedling will be the test plant. You are going to place it inside a dark container.

First, cut open one side of the container. (Save the side – you'll need it later.) Tape three folded pieces of cardboard to the insides of the container. Two on one side, one on the other. The three pieces of cardboard should look like three platforms, one higher than the next. When this is done, close up the open side of the container with masking tape. This will be the door side.



Before you cover up the plant, cut out a little window in the top of the container above the top platform. This will be the window for light. Now place the test lima bean seedling in the container. What is a good way to get water to the plant (without picking up the container)? One way might be this: cut out a water door just above the dirt level of the plant.

Remember to water this plant every day, too.

At the beginning of each week, open the door side of the container. Is the plant in the dark growing? Compare it with the plant by the window. Make a chart for 2 weeks to tell what you see about both plants. Be sure to write down the way each plant is growing or where it's pointing to.

SUMMARY

1. Do you think the plant by the window grows the same as the plant in the container? If yes, tell why. If no, also tell why.

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_____

_____

2.Why do plants growing outdoors usually grow straight up?

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_____

_____

3. What does sunlight make plants do? (Answer this when you finish making your observations of the two seedlings.)

_____

_____

_____

1. Test different color lights on a plant. See how each may change the way the plant grows.
2. Keep two different color lights shining at lima bean seedlings. To which light do the plants grow?
3. Cut the growing tip off a bean seedling. How does the rest of the seedling react to light?

Plants and animals seem to be alike in many ways. One of the things that keeps your feet on the ground is gravity. Is a plant held down by gravity?

GROWING TWO GENERATIONS OF A FERN

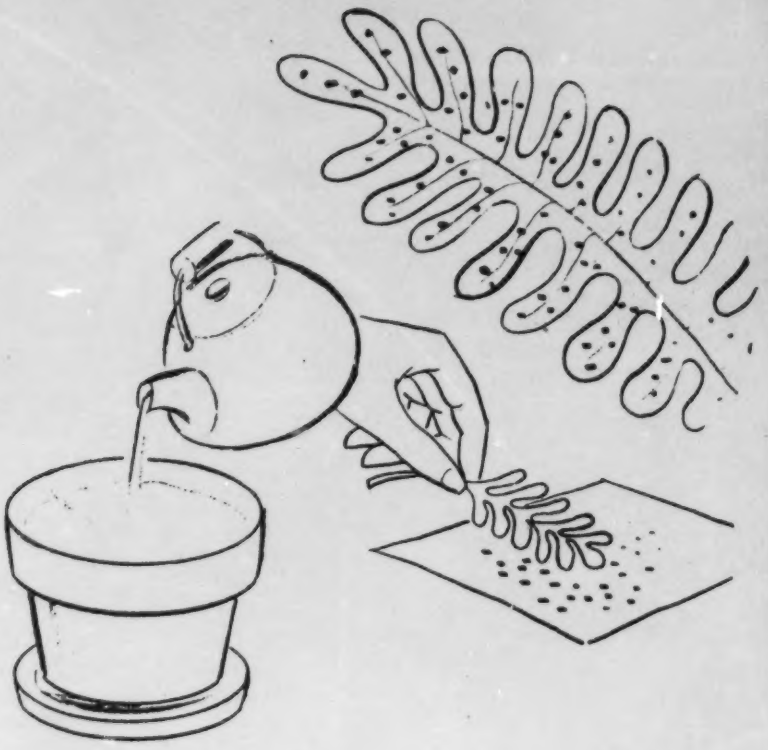
Materials you'll need:

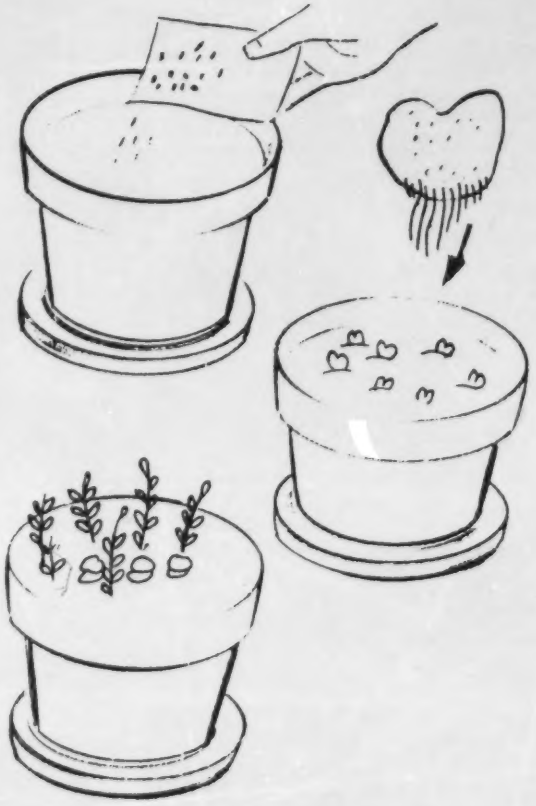
bog terrarium, soil, peat moss, sand, boiling water, pot, saucer, piece of plastic

A fern has to go through two generations to complete its life cycle. The asexual plant is the familiar one you will see growing in the woods. The sexual plant is a tiny, heart-shaped plant seldom seen by nature lovers. You can grow both plants if you follow the directions carefully.

The sporaphyte generation (asexual) will thrive well in a bog terrarium. Have the new home established before you go fern hunting. Ferns are found in wooded areas along the banks of streams or in a marshy environment. Dig up the plant being sure the entire underground stem is taken with it. Wrap it in wet newspaper and transfer the plant to a woodland terrarium. Keep the terrarium in a north window and water frequently.

To grow the second generation, the gametophyte, wait until the spores appear on the under side of the fronds. Tap the compound leaf over a sheet of paper and the spores will fall off. Fill a pot with soil and peat moss. Put a layer of sand on the top. Pour boiling water over the whole mixture and the container to destroy any bacteria or mold spores which will attack the germinating fern spores. Let it cool. Sprinkle the spores on the sand, cover the pot with clear plastic or glass, and set the pot in a saucer in order to water from the bottom up. In several weeks the spores will develop into tiny, heart - shaped gametophyte plants. This plant produces eggs and sperms. When a sperm fertilizes an egg, a small fern sporophyte will grow out of this plant. When it is several inches tall transfer it to the bog terrarium.





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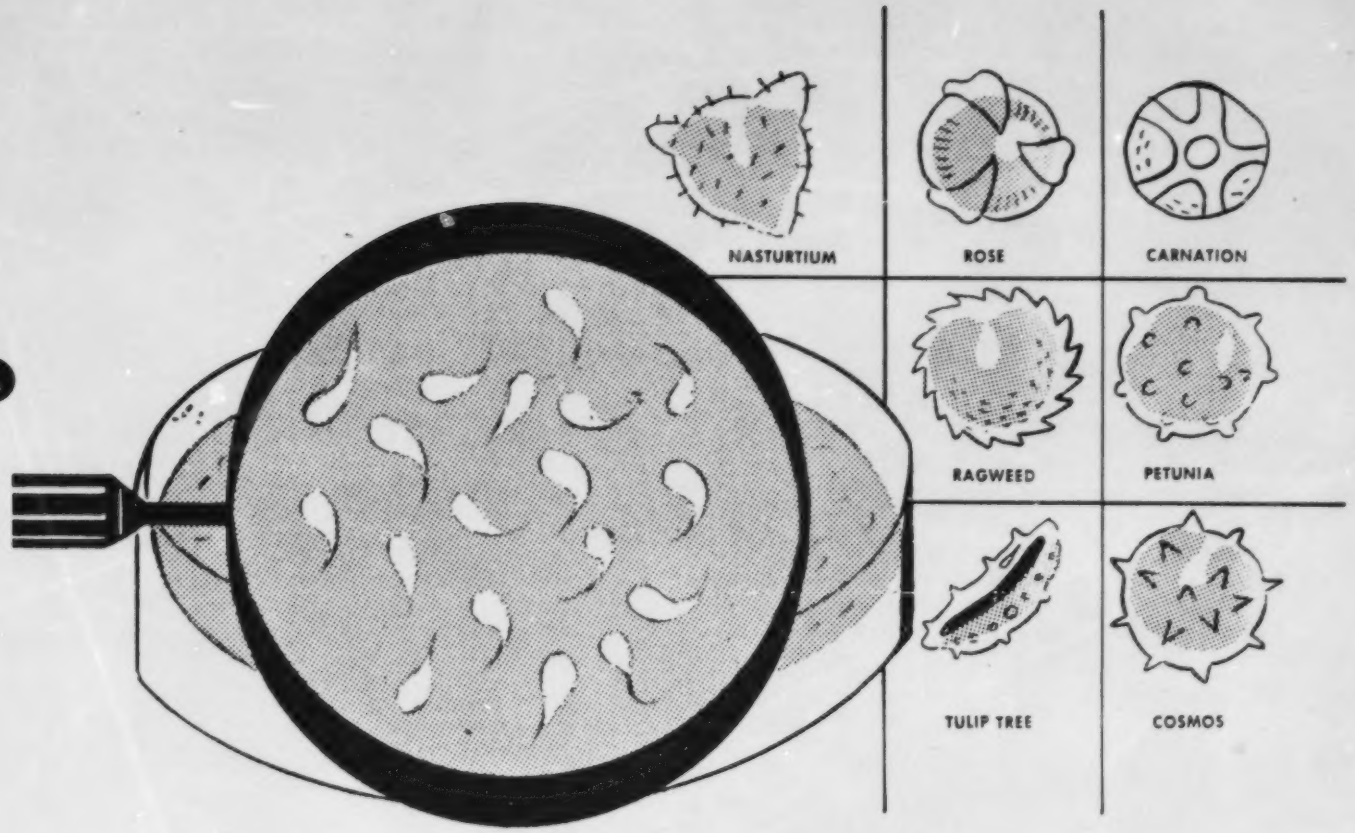


EXPERIMENTING WITH POLLEN

Materials you'll need:

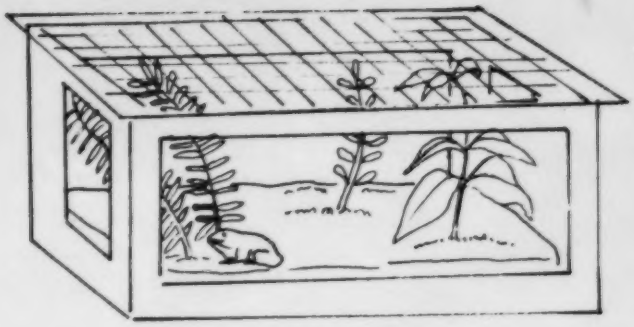
flowers, glass slides, glue, cover glasses, microscope, sugar solution, shallow dish with cover, hand lens

Collect flowers from as many plants as you can find. Spread a thin film of glue in the center of several glass microscope slides. Shake a different flower over each slide. The pollen will stick to the glue. Carefully place a cover glass over each sample. Observe them under a microscope. How many shapes and sizes do you find? Pollen identification is helpful to doctors in determining allergies, and to honey farmers in knowing what pollen their bees are collecting. The illustration shows a few shapes to look for.

Pollen forms on the male parts of a flower called the stamen. Some of the pollen grains are dusted onto the head of the female part of the flower, or pistil. The pollen must grow an extension that will go down through the pistil into the ovary of the flower in order to reach the egg to fertilize it. Only when this happens do the new seeds develop.

Make a thin sugar solution. This will serve as a medium in which the pollen grains can grow. Locate a freshly-opened flower. Shake the stamen (the stalk usually with yellow knobs) over the solution. Cover the dish and let it stand for an hour. Using a hand lens, observe the long extension which has sprouted from each grain. This is the pollen tube which grows down the pistil so that the pollen nucleus can join the nucleus of the egg.

STOCKING A TERRARIUM



A terrarium is always a miniature scene of outdoor life. It can be used just for plants or you can use it as a home for small animals. Large animals trample and kill the plants. Decide what kind of scene you want to build and then gather the appropriate plants and animals. The soil will be different in each kind of terrarium.

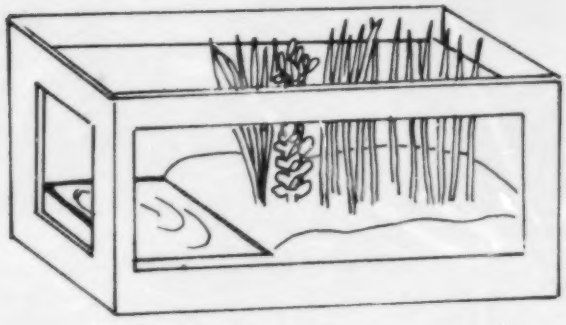
A glass jar, an old aquarium, or a terrarium you constructed yourself may be used to hold these different earth scenes.

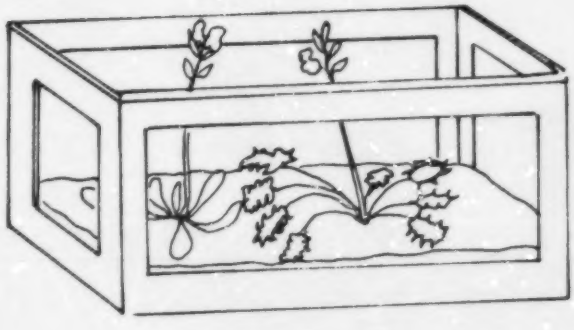
A woodland terrarium needs a layer of gravel and bits of charcoal on the bottom, covered with several inches of rich garden soil Small woodland plants, such as wild strawberry, fern, and moss, may be transplanted into it. Water the plants right after transplanting. Salamanders, toads, and tree frogs enjoy this kind of world. Do not put the woodland terrarium in direct sunlight because these plants and animals thrive in shady places. If you have no animal life, try scaling the terrarium. This means that the moisture inside will continually evaporate and condense. Put a sheet of glass over the top and watch conditions inside for a week. If no mold has formed (indicating too much moisture) or the earth is not dry and cracked, seal the top to the sides with melted paraffin.

A desert terrarium needs sandy soil in which cacti and succulent plants are grown. Small snakes and horned toads thrive in this environment. This kind of a terrarium can use more sunlight than the others.

The bog terrarium should contain a mixture of one part sand, one part peat moss, and one part gravel. Bog life needs more moisture than the others. This environment is ideal for insectivorous plants, such as the pitcher plant, sundew, and Venus' flytrap.

The scene is a semi-aquatic terrarium imitates the environment along a river bank. It is a good kind of home for amphibians. A pan at one end of the container holds the water, and the remaining section should be built up with rich soil. Small plants found on the edge of a stream may be transplanted. Aquatic bladderwort, for example, thrives in this world. Tadpoles and water insects may be kept in the water habitat.





GRAFTING PLANTS

Materials you'll need:

sharp knife, rags, resin, beeswax, tallow, linseed oil, brush, selected plants

Grafting is a technique used by gardeners to attach the growing part of one plant on to another living plant in order to develop new characteristics. It is not difficult to do if you follow certain basic rules.

1. Graft plants only in the winter or spring when the plants are dormant.

2. The stock (base plant) the cion (part of another plant to be grafted) should belong to the same species. For example, a branch of a Delicious apple tree can be attached to a Winesap apple tree but not to a cherry tree.

3. Be sure that the cambium (meristematic or growing layer) or the cion and stock touch each orther.

4. Select only strong, healthy plants free from apparent disease.

5. Cover the joined parts with wax and wrap securely to prevent water loss and to keep the cion in place. A wax can be made with four parts resin, two parts beeswax, one part tallow, and one-half part linseed oil. Combine all ingredients and heat. Apply with a brush when slightly cool.

There are four basic methods of grafting: bud, whip, saddle, and cleft grafing. Follow the above illustrations while trying the four methods.

GROWING FLOWERS FROM VEGETABLES

Materials you'll need:

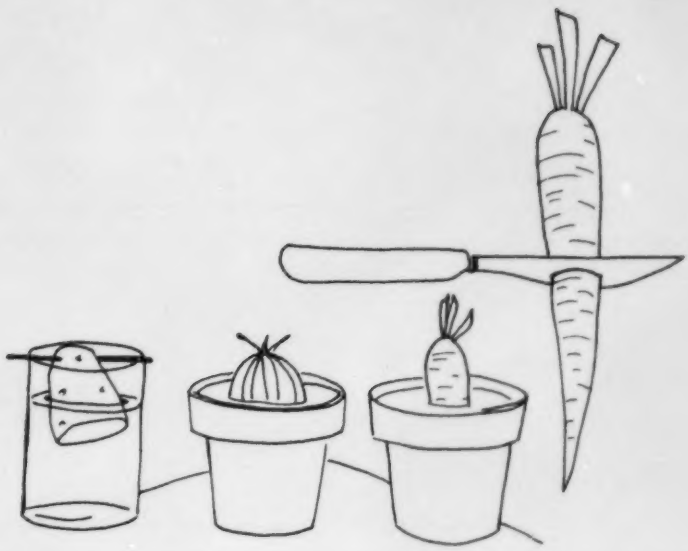
pots of wet sand or vermiculite, variety of vegetables

Purchase from the market or select from your family garden a variety of vegetables which store food in their roots or stems. Be sure that all parts of the plant are intact. Many of these plants are biennials. A biennial needs two growing seasons to complete its life cycle. The first year it produces roots, a stem and leaves. The roots live through the winter and the new plant, which bears the flower, fruit, and seeds, springs up from the roots the following spring. People don't often see this second year of the vegetable's growth.

Cut the bottom half from a root such as a carrot, beet, turnip, radish, and sweet potato. Push the cut ends into a pot of wet sand or vermiculite.

An underground stem, such as the white potato, will root if half of it is submerged in a glass of water. Onion bulbs may be planted directly into a pot of rich garden soil.

All of these vegetables will take root, send up new shoots, and soon a flower head will appear.



ACTIVITIES

PLANTS WITHOUT SEEDS – Reducers / Decomposers

Preliminary Classroom Activites

1. * Identify lower plants using Science in Our World transparencies and Wollensak-tape-Seedless Plants.
2. Set up 4 petri dishes with bread, fruit, leather, to determine how non-green plants cause decomposition.
3. Grow mold and draw spores (pp. 46 – 48).
4. Set up experiments on yeast (p. 49).
5. Put a sample of moist soil with dead leaves in jar to observe decomposition called leaf mold or humus.
6. Build a compost heap (p. 50).

Center Activities

1. Identify algae, mosses, ferns, lichens, slime molds.
2. See enlargement of algae, spores of slime molds, spores from ferns.
3. Illustrate how decayed material builds soil.

Culminating Classroom Activities

1. + Collect mushrooms, and make spore print (p. 50).
2. Compare green to non-green plants (pp. 51–52).
3. Make chart of decomposer (p. 53) and living thing being decomposed (p. 53).
4. Collect and grow fungi (p. 55).
5. Reproduce moss (p. 55).

INTRODUCTION

Bread is one of our main foods. Early in his history, man learned to grind wild grains to make flour. Then he baked the flour into bread. Today, computers are often used to grind the grain, mix the flour, and run the ovens that bake the bread we eat. For most of us, bread is a part of almost every meal we eat. Bread is a food on which we spread other food, like butter, jam, peanut butter, or cheese. Often, we stuff food between two slices of bread and call it a sandwich.

Other living things also eat the bread we make. Microscopic plants, called mold, use bread as their food – especially, old stale bread. We say bread is moldy when we see what often looks like a green or blue cotton puff on the bread. This is really a large colony of small, fuzzy mold plants. When mold grows on bread, people usually throw the bread away. They also throw away moldy oranges, moldy butter, and other foods that mold has begun to feed on.

Where does mold come from? What are the parts of a mold? Why does it grow on bread? Mold has an interesting story.

INVESTIGATION

How does mold grow?

MATERIALS

stale (old) bread
paper towels
cotton swabs or forceps
microscope
slide and cover slip
magnifying glass
medicine dropper
plastic dish

PROCEDURE

In this investigation you are going to grow your own plants without buying any plants or planting any seeds. The plants will seem to come to you from the air! You are going to have to "catch" your plants from the air. The "bait" will be a piece of old bread.

You can do this in class or at home. Wet two paper towels. Fold them and put them in a plastic dish. Sprinkle a few drops of water on a piece of bread to make it damp (do not soak it), and place the bread on top of the wet towels. Leave the dish in the open air for about half an hour. Cover it and put it away in a dark closet or drawer.

Look at the dish each day. Keep a record of your observations.

Date	Color of Bread	Other Changes

53

After 2 or 3 days, make a drawing of the piece of bread.

Before you go on, think about these questions: How did the mold begin growing in the dish? Where do you think it came from? Why don't we see mold growing on fresh bread? Try making a guess.

_____

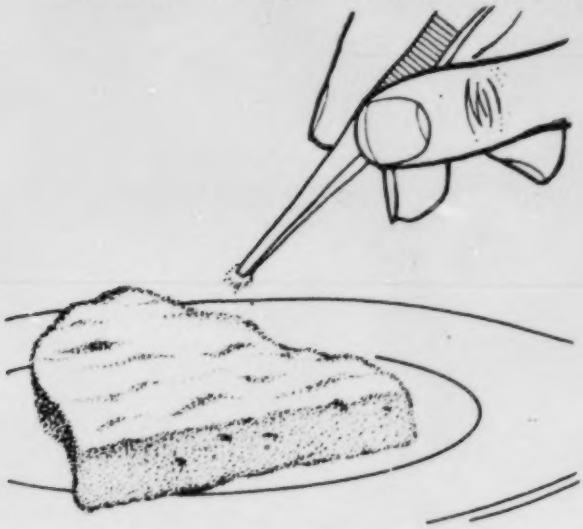
_____

_____

Look at the mold with a magnifying glass. Draw a small part of the mold as you see it magnified.

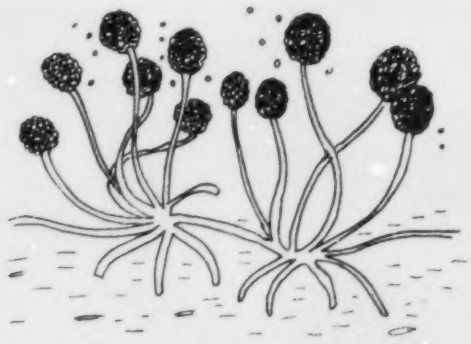
Because the mold is so small, it is better to look at it through a microscope. Put a drop of water in the middle of a microscope slide with a medicine dropper.

Using forceps or a cotton swab, pick up just a few threads of mold. Place them in the drop of water. Cover with a cover slip and focus the microscope.



Even after you get a clear look at the mold under low power, you will see only a small part of the mold plant. The main body of the plant is growing inside the bread. The parts seen growing on top of the bread are the reproductive parts of the mold. They look like fluffy cotton.

Now, look at the mold under high power. Make a drawing of what you see. The round things that look like dots are called spores. Wind can carry these spores long distances. When they land on a piece of bread or other food, the spores begin to grow into a fluffy mold colony. They grow best where there is food, moisture, warmth, and darkness.



Here is what a mold plant looks like. The spores come from the round tops of the plant.

With your forceps or cotton swab, take some mold from the moldy bread and put it on another piece of stale bread. Place the bread on a wet paper towel and put the two things in a covered dish. After a few days, look at the bread.

Record your observations, telling all changes and colors.

Mold is a very simple plant. It does not have the green coloring material chlorophyll (KLO-ra-fil) of other plants. (Some mold is green in color. But this is not the chemical chlorophyll.) Therefore, it is one of the plants that does not use sunlight to make its food. This is the reason why mold can grow in the dark. Mold also grows on its own food supply. Just as a sponge takes in water, mold takes in food from the material on which it grows.

SUMMARY

1. How did the mold you grew get on the first piece of bread?

_____

_____

_____

_____

2. What is needed to grow molds?

_____

_____

_____

3. How do growing mold plants get their food?

_____

_____

_____

4. Why don't you see mold growing on fresh bread?

_____

_____

_____

FOR FURTHER INVESTIGATION

1. Try to grow mold on other foods, such as oranges, cooked potatoes, apples, or cookies. Keep a record on a chart like this one.

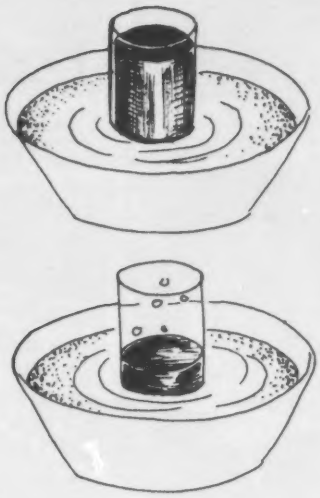
MOLD GROWTH CHART

Date	Food Mold Is Growing On	Changes Seen

2. Grow mold under different conditions. How do each of these change the way mold grows:
   a. electric light.
   b. sunlight.
   c. cold temperatures.
   d. high temperatures.

WHAT'S NEXT . . .

Plants – green and nongreen – make up one part of the living world. Animals make up the other. Where's a good place to study plants and animals together?



OBSERVING YEAST WORK

Materials you'll need:

molasses, 2 cereal bowls, 2 water glasses, commercial yeast cake, coasters

Yeast is a tiny plant which can ferment sugar, producing alcohol and carbon dioxide gas. Molasses is a good food for the yeast to work on since there is so much sugar in it.

Mix one-half cup of molasses and one quart of water. Fill each cereal bowl about half full with the mixture. Fill both glasses with the diluted molasses and drop one-fourth of a yeast cake into one of the glasses. Hold a coaster over the top of each tumbler and turn it upside down in the bowl.

As the yeast starts to ferment the molasses, carbon dioxide gas (CO_2) will be formed. The gas will push the molasses out of the glass into the bowl. In three or four hours all the molasses will have been pushed out of the glass. What has happened in the other glass?

SEEING THE EFFECT OF YEAST ON DOUGH

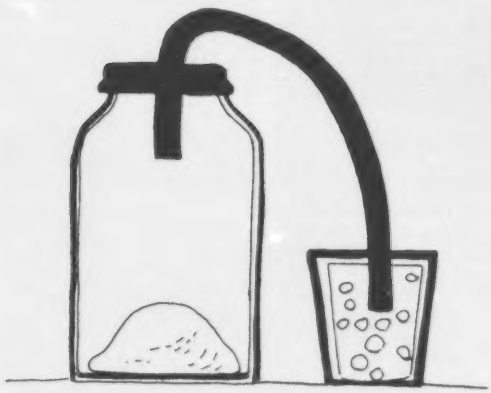
Materials you'll need:

flour, sugar, commercial yeast, water, large screw-top jar, candle wax, 2 feet of rubber tubing, limewater

Puncture an opening in a metal cover of a glass jar. Insert one end of a length of rubber tubing through the hole. Place melted wax around the hole to be sure the connection is airtight. Submerge the other end of the tube in a glass of limewater.

Combine one cup of flour, one tablespoon of sugar, one-fourth package of commercial yeast, and one-half cup of water. This is a crude form of bread dough. Place this mixture in the glass jar. Screw on the top immediately.

Set this jar in a warm place. Soon the dough will rise. Remove the lid, puncture the mound of dough, and quickly close the jar again. The gas that caused the bread to rise escapes into the tube that leads to the limewater. Since the gas given off by the yeast is carbon dioxide the limewater will turn milky.



MAKING YOUR OWN COMPOST FERTILIZER

Materials you'll need:
wire fencing, grass, leaves, garbage, ashes

If you are a serious gardener, you will find that a compost pile provides the most satisfactory fertilizer. It is necessary to start the pile the year before you will want to use it.

Choose a hidden, shady corner of the yard. Dig a pit which is about four feet by six feet and two feet deep. Around the hole, erect a wire fence. It should not be too high for you to reach over comfortably to turn over the rotting material occasionally.

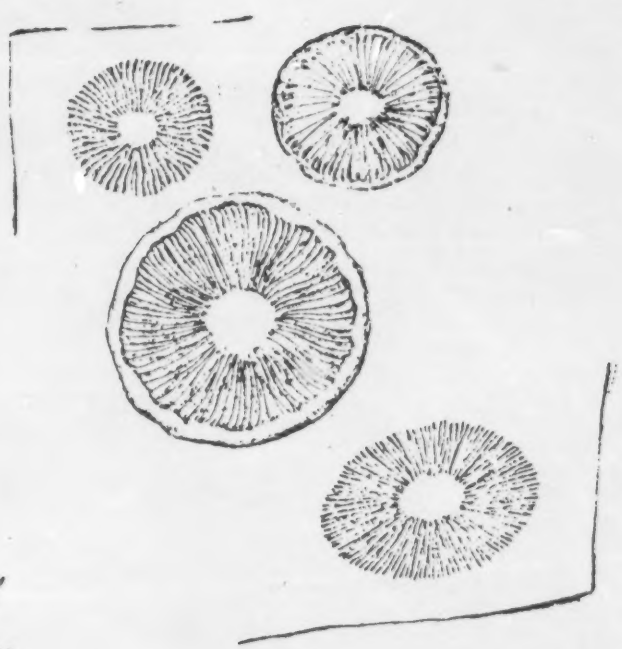
Fill the hole with grass cuttings, a little kitchen garbage, sifted wood ashes from a fireplace, dead leaves, cornstalks, or any other organic material available. Wet it down with a sprinkler. When the contents of the pile have disintegrated into fine pieces (after several months), the compost is ready to be worked into the soil. You are returning to the soil the elements necessary for the growth of your plants. The compost will supply lime, phosphorus, potassium, nitrogen and calcium.

MAKING A SPORE PRINT

Get a mushroom. Cut off the cap and place it gently on a piece of light-colored paper. Cover the mushroom with a dish and leave it for a day.

Gently lift the dish and the cap. This is what you may see.

This is a spore print. It was made by the thousands of spores that fell from beneath the mushroom cap.



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STUDENT WORKSHEET

ECOLOGY

TASK:

Determine how green plants differ from non-green plants.

MATERIALS:

Samples of bean plants
Samples of mushrooms
Diagram of a green plant

PROCEDURE:

1. Label the five main parts of a green plant.

2. Green plants are able to make their own food through a process called _____.

3. a. What chemical substance gives the green plant its color? 3a. _____

   b. What are the raw materials needed by the plant to make food? b. _____

   c. Where are these raw materials found? c. _____

   d. How do the raw materials enter the plant? d. _____

   e. What part of the plant acts like a factory, changing these raw materials into food for the plant? e. _____

4. Each factory of the plant works only during what hours? Why?

4. _____

_____

5. Examine the mushroom, an example of a non-green plant. How is it different from green plants?

5. _____

_____

_____

6. Without chlorophyll, can non-green plants make their own food? If not, how are they able to live?

6. _____

_____

7. In the woods, you can find many fungi (non-green plants) on dead trees and logs.
   a. What are these fungi doing to the dead things?
   b. Why is this function so important in maintaining a balance in nature?

7.a. _____

_____

b. _____

_____

_____

RESULTS:

1. How are green plants used by other living things?

1. _____

_____

2. What is the function of non-green plants in the environment?

2. _____

_____

Non-green plants, unable to make their own food, are dependent upon living things in their environment for survival, and in turn act as decomposers.

OBJECTIVES:

1. The students will take a field trip to a wooded area and will collect non-green plants and the living things being decomposed for observation. Then, they will record on the chart provided the decomposer (non-green plant) and the living thing being decomposed. Each student will collect and identify at least three decomposers and the living things being decomposed.

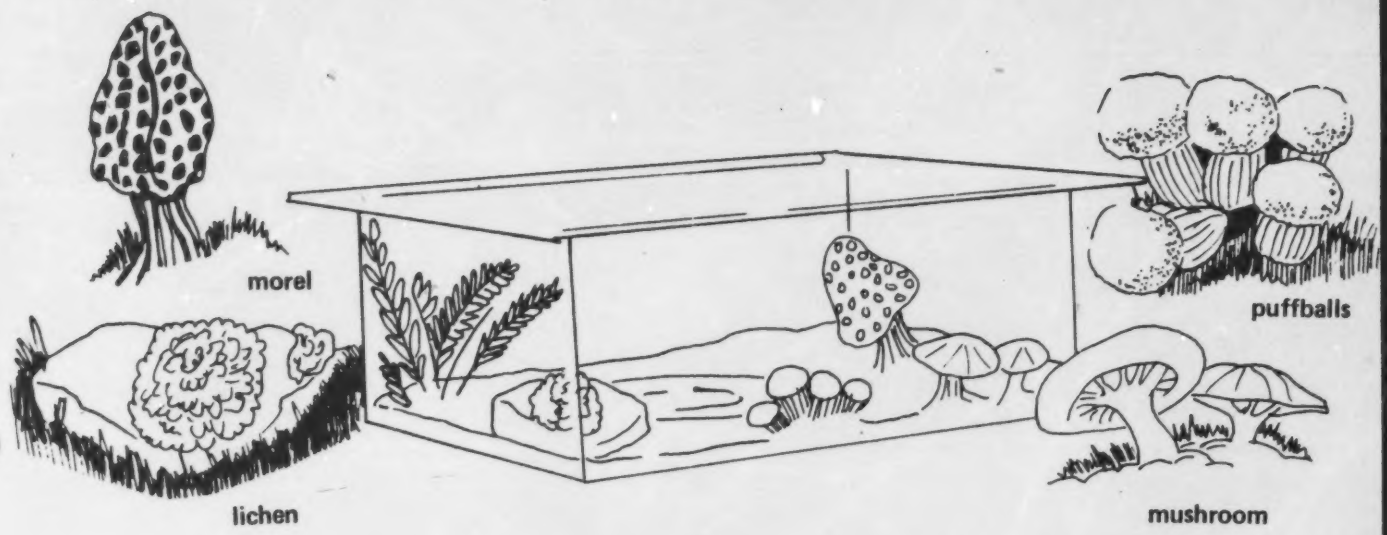
2. Provided with four saucers or petri dishes and items such as bread, fruit, and leather, the students will conduct an experiment to determine how non-green plants cause living things to decompose. Performance level to be determined by the teacher.

3. Upon completion of the preceeding objectives, the students will write at least one paragraph in which they will correctly relate the importance of non-green plants to their environment.

ACTIVITIES:

1. Students will take a field trip to a wooded area in order to collect and observe non-green plants (decomposers) and living things being decomposed. They will record this information on a chart provided by the teacher. (A chart similar to the one below may be illustrated on the chalkboard.)

DECOMPOSER	LIVING THING BEING DECOMPOSED
1.	
2.	
3.	
4.	
5.	



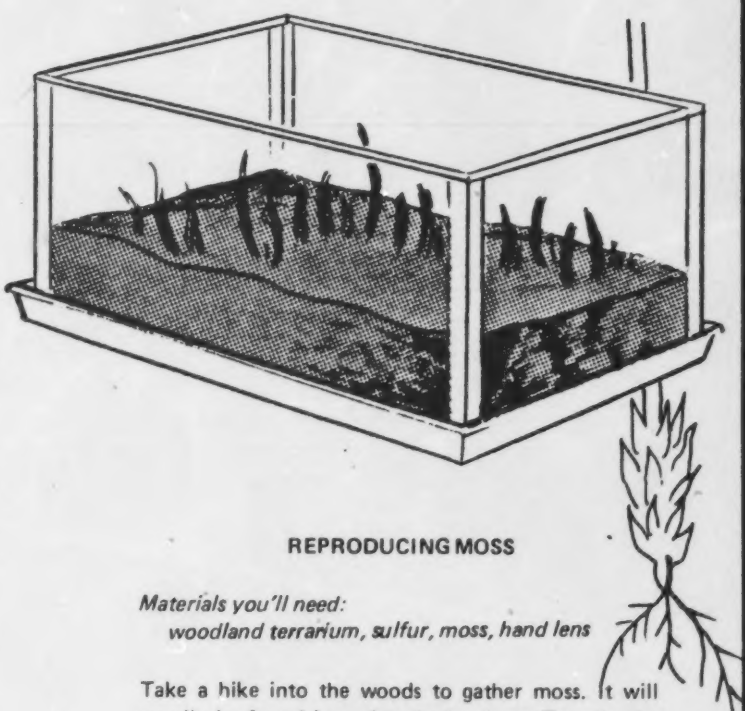
COLLECTING FUNGI

Materials you'll need:
glass jars, alcohol, terrarium

Fungi are found almost everywhere and are most successfully collected in the spring or fall months. The fungus, lacking chlorophyll, must take its nourishment from its host, the material to which it attaches itself. The parasite fungus takes life from living organisms and the saprophyte fungus lives on dead or decayed material.

Look for mushrooms, tree brackets, puffballs, toadstools, morels, lichen, smut, mold, rust, mildew. Some grow on trees and bushes, some on river banks, in open fields, and still others on dead logs. Dry fungi may be put in jars or boxes. Fleshy fungi should be dried or placed in alcohol.

A living fungus collection may be raised in a terrarium – half woodland and half bog environment. The fungi grow best in warm, damp places. It is necessary to use care in digging them up from their natural habitat. Take a clump of soil and vegetation with their underground parts. Many fungi have root-like structures called rhizoids or mycelium that may break. Keep the terrarium out of direct sunlight and water it often.



REPRODUCING MOSS

Materials you'll need:
woodland terrarium, sulfur, moss, hand lens

Take a hike into the woods to gather moss. It will usually be found in moist, shady places. Transfer the plants and soil to a woodland terrarium. Water well and do not keep your moss house in direct sunlight. A little sulfur sprinkled in the soil will prevent growth of mold.

Examine the tops of the little upright shoots with a hand lens. One kind will produce the sperm and another will form the eggs. After the egg is fertilized by the sperm a little stalk grows up out of the female head. At the top of the stalk will be the capsule containing the spores. When the capsule breaks open the spores fall to the soil and germinate into new plants.

ACTIVITIES

ANIMALS WITHOUT BACKBONES

Preliminary Classroom Activities

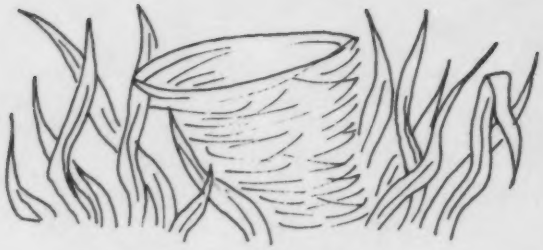
1. Introduce invertebrates by using the Wollensak Science Tape-Invertebrate.
2. Show pictures of invertebrates likely to be seen at the Center.
3. Make flash cards of various invertebrates and let children identify them.
4. Show children how to identify animal homes (p. 56).

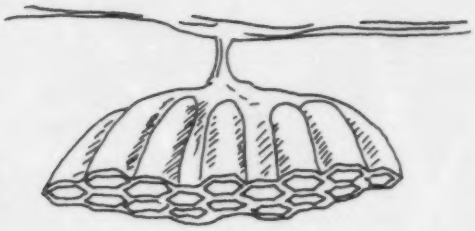
Center Activities

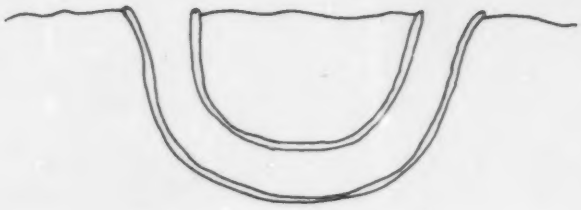
1. Select four students for group work; one with equipment (net, coffee can, magnifying glasses, forceps) one recorder, two collectors.
2. Roll over dead limbs, trunks and show how to collect specimens.
3. Observe ant hills, earthworm tunnels, and remains of animals (wings); possibly take pictures of these.

Culminating Classroom Activities

1. Construct cage for collecting specimens (p. 57).
2. Make and use insect killing jar and mount specimens (pp. 57–58).
3. Set up ant colony to observe and study (See People, Concepts, Processes McGraw-Hill, year 5, pp. 25 – 29).
4. Select an invertebrate and explain the role it plays in its habitat.

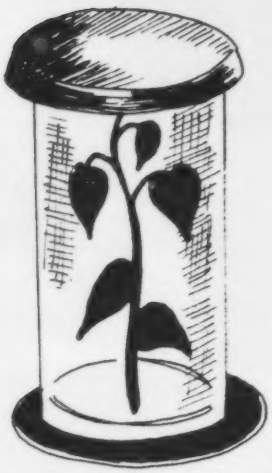


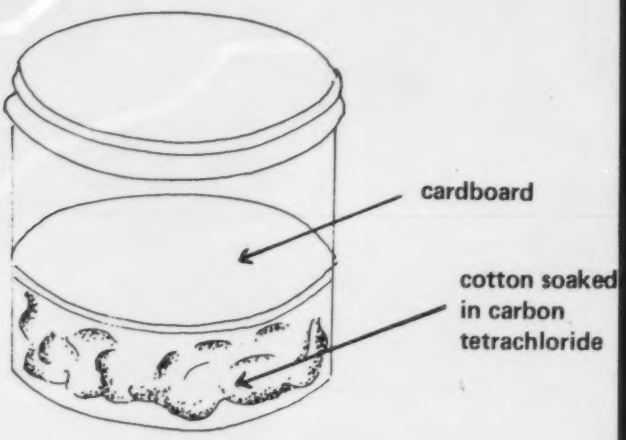




COLLECTING INSECTS

An insect collector needs several field tools to help him in assembling a complete display. First, insects must be captured with an aerial insect net. If you are planning to keep them alive, you must construct an insect cage. Killing insects requires a certain kind of container. Some of the insects must be dried on a spreading board. If a good specimen gets too dry and brittle before you can mount it, you will need a relaxing jar. The final step in collecting is mounting and labeling your display. The following five activities will help you work with your collection.





MAKING A CAGE FOR LIVE INSECTS

Materials you'll need:
small wire mesh, 2 cake pans, plaster of Paris, branch, wire

Roll the wire mesh into a cylinder and sew the seam with a piece of wire. Mix plaster of Paris and water to the consistency of heavy cream. Pour it into one of the cake pans and insert one end of the wire cylinder into it. Push a branch into the center of the plaster of Paris. Let this set until it has hardened. Put the other pan over the top as a movable lid. Furnish your insects with vegetation (the plants they were found on) sprinkled with water.

MAKING A KILLING JAR

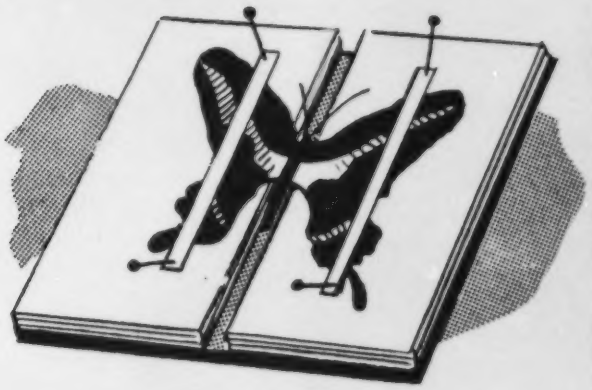
Materials you'll need:
peanut butter jar, cotton, cardboard, carbon tetrachloride

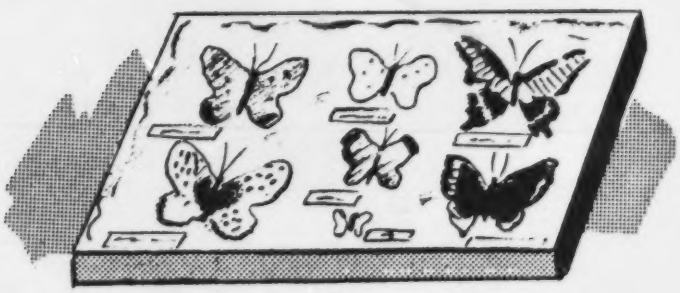
If you plan to mount insects, they must first be killed without damaging them. A broad-mouthed peanut butter jar makes a good container for this purpose. Soak a layer of cotton in carbon tetrachloride. Be sure to do this out-of-doors. Put it in the bottom of the jar and cover the cotton with a cardboard disk. Remember, the jar should be covered except when insects are being put in or removed. Leave the insects in the killing jar overnight.

MAKING A SPREADING BOARD

Materials you'll need:
heavy cardboard, wooden base, nails, pins

Butterflies and moths should be pinned on a spreading board in order to dry their wings in a spread formation. A spreading board can be made by nailing two stacks of several layers of heavy cardboard to a wooden base, leaving a small, even groove down the center. Lay the body of the insect in the groove and spread the wings over the cardboard. Hold the wings in place by pinning them down with little strips of paper. Follow the illustration.





MOUNTING INSECTS

Materials you'll need:
flat box, moth balls, cotton, sheet of glass or plastic, glue

Insects may be mounted on pins or placed directly on a layer of cotton in a flat box. Spread moth balls or crystals under the cotton to prevent other insects from destroying your collection. A spot of glue under the insect will hold it on the cotton. Make paper labels for your specimens and glue these beside the insects. Tape a sheet of glass or clear plastic on the top of the box. This will keep it relatively airtight and the display will last for years.

MAKING A RELAXING JAR

Materials you'll need:
peanut butter jar, cotton, cardboard disk

In order to be mounted, insects must be pliable or easily bent. If they are not, parts will break off. If an insect has been left too long in the killing jar or is found after it has been dead for some time, it will have become brittle.

Soak in water enough absorbent cotton to cover the bottom of the jar. Place it in the jar and cover it with a circle of cardboard. The insect should be placed on the cardboard rather than directly on the wet cotton. Cover the jar tightly for a few hours. The high humidity inside the sealed jar will make the insect flexible enough to mount.

ACTIVITIES

ANIMALS WITH BACKBONES

Preliminary Classroom Activities

1. * Introduce vertebrates by using Wollensak Science Tape-Vertebrates.
2. Show pictures of common native animals and let children classify as amphibian, bird, reptile, mammal, fish.
3. * Show tracks and traces of common native animals and how to identify them (p. 62). See Pocket Guide to Animal Tracks.
4. * Emphasize distinguishing characteristics of poisonous snakes common to this area and show illustrations. (See "The Poisonous Snakes of Louisiana and the Emergency Treatment of their Bites").

Center Activities

1. Observe animals available in the Living Lab.
2. Complete chart of animals seen, heard, and traces (p. 60).
3. Observe animal tracks and if possible, make plaster cast (p. 61).
4. Note homes of animals, holes in trees (p.61).
5. Photograph traces, tracks or animals seen.
6. Observe and list possible food sources for animals in the area.

Culminating Classroom Activities

1. Take photographs and identify with handbook or booklet .
2. Draw pictures of various kinds of animal homes.

List all the animals and animal traces you find in this place.

Findings

Animals seen (name or sketch)	Description
Animals heard (name or sketch)	**Description of sound**
Animal traces seen (describe or sketch)	**Animal you think left trace**

Of the animals you have seen or have found evidence of, choose one and try to discover all you can about it. Put yourself in the animal's role. What would you eat and where would you find your food? Is there a danger that another animal might eat you? What animal would that be? Where would you go for water?

Thought provoking questions . . .

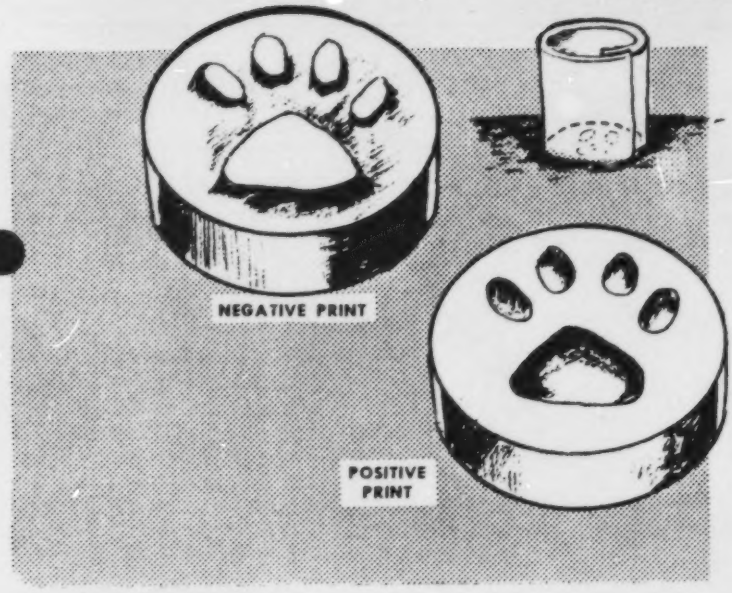
1. Do you hear any animal sounds? A singing bird, a croaking frog, the rustling of branches all tell you when animals are near.

2. What are the sounds that you hear? What animals do you think are making these sounds?

3. Can you find any traces of animals? Look for tracks, droppings, nests, bits of hair, bones, burrows.

4. Do you see any animals? What are they?

PRESERVING ANIMAL TRACKS



Materials you'll need:

cardboard, plaster of Paris, grease, pan, spoon, grease

Take a hike to the woods with a sack of plaster of Paris, pan, water, spoon, and cardboard cylinders. When a footprint of some animal is discovered on the ground place the circle of cardboard around it. Mix some water in the plaster of Paris to the thickness of thin pudding. Pour this mixture over the animal track and let the plaster harden. Remove the cardboard, clean the soil off the surface, and grease the raised print with grease or petroleum jelly. This is the negative print.

Place another circle of cardboard around this mold so it extends a little above the level of the negative print. Pour another mixture of plaster of Paris on top of the first mold. When this hardens, separate the two pieces. The second casting is a positive print — depression — of the animal's footprint.

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CORRELATING ACTIVITIES

ART

1. Color cloth with natural dyes (p. 64).
2. Make spatter and/or smoke prints of leaves (p. 65).
3. Wax leaves with paraffin (p. 65).
4. Make skeleton leaves (p. 65).
5. Make fern and thumb prints (p. 66).
6. Design posters for fire prevention, for care of the environment.
7. Dry flowers (p. 67).
8. Preserve spider webs (p. 67).

LANGUAGE ARTS

1. Write letters for free materials (see appendix).
2. Create poems about trees on leaf shapes (pp. 68–69).
3. Pretend the land is yours; how would you like to see this land used - - - sketch or write a poem or short story on the changes you would make.
4. Imagine what the tiniest sounds in the forest are like; describe what you think the tiniest sound is using a sketch or poem, etc.
5. List a least five relationships between living and non-living factors in the immediate environment.
6. Write at least one paragraph in which they will relate the importance of non-green plants to their environment.

Social Studies

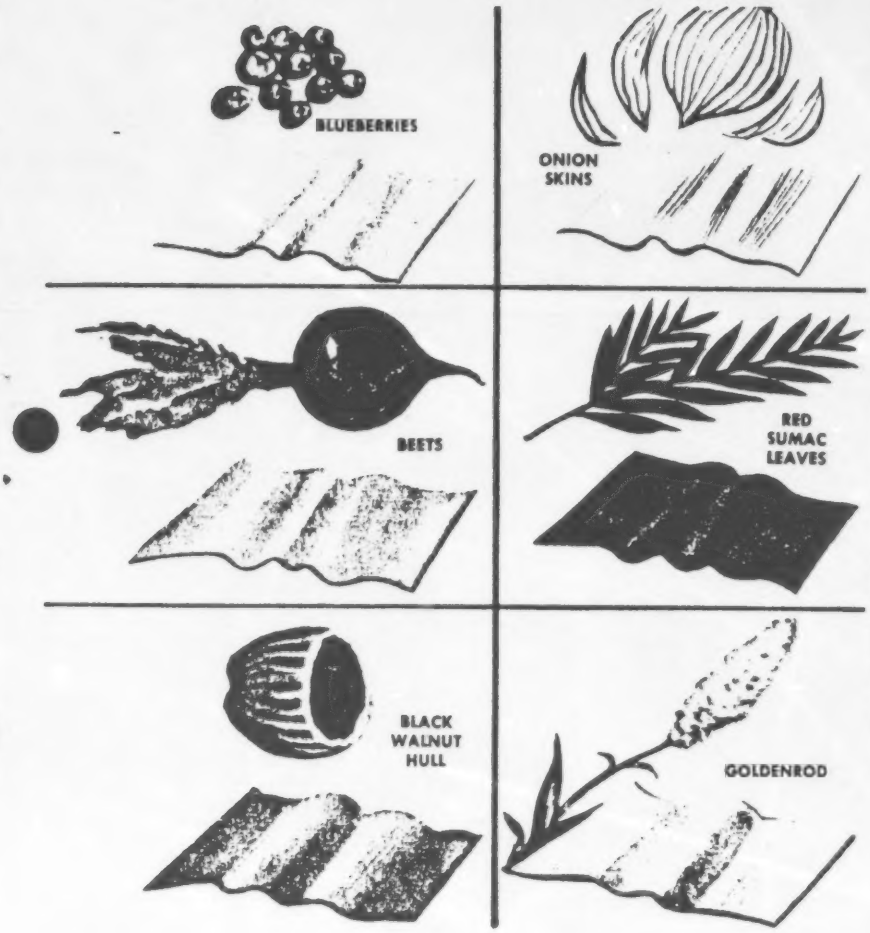
1. Draw a map of your state and indicate the forest areas.

2. Discuss importance of tree industry, soil conservation to your state.

3. Construct posters showing the various uses of the tree.

4. Do research concerning vocations related to the Center like forestry, soil and water conservationists, botanists, chemists, geologists.

5. Invite speakers from various vocations to explain their job, necessary training.



COLORING CLOTH WITH NATURAL DYES

Materials you'll need:

variety of white fabric, samples of fruits, vegetables, parts of trees, pan, strainer, stove

It was everyday work for Indians and pioneers to dye material with vegetable and fruit juices. You can dye fabric the same way.

Wash well and cut to uniform size, one piece each of white cotton, white rayon, white linen, white wool, and white nylon.

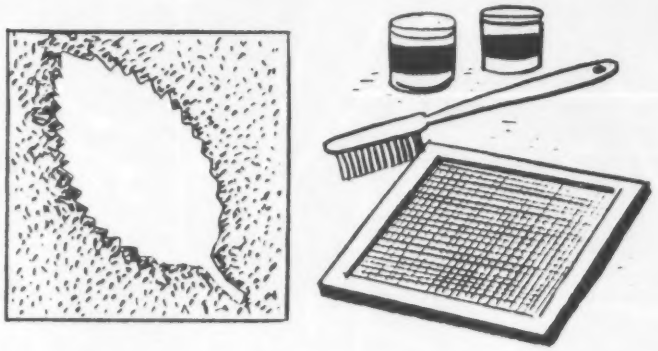
Chop leaves, grind roots and stems, or crush berries. Soak the plant pieces overnight in enough water to cover. Boil slowly for one hour. Strain dye, removing the plant material. Dip cloth samples in water and wring them out. Put them in the dye bath and cover. Simmer slowly until material is the desired color. The color will lighten up as it dries. Let the cloth almost dry and then iron it smooth.

Some natural dyes that can be obtained are: light brown, yellow, and orange from onion skins, roots of white mulberry, wood from sumac, roots from osage orange hedge, and carrots; green from spinach; rose from beets, pokeweed berries, and roots from dogwood; gold from goldenrod flowers; brown from coffee and hulls of black walnut; red from red sumac berries, bloodroot roots, and red raspberries; black from red sumac leaves; blue from red maple and blue ash bark, and blueberries; purple from red cedar roots.

MAKING SPATTER PRINTS OF LEAVES

Materials you'll need:
white paper, fine mesh screen, toothbrush, water colors, wooden form

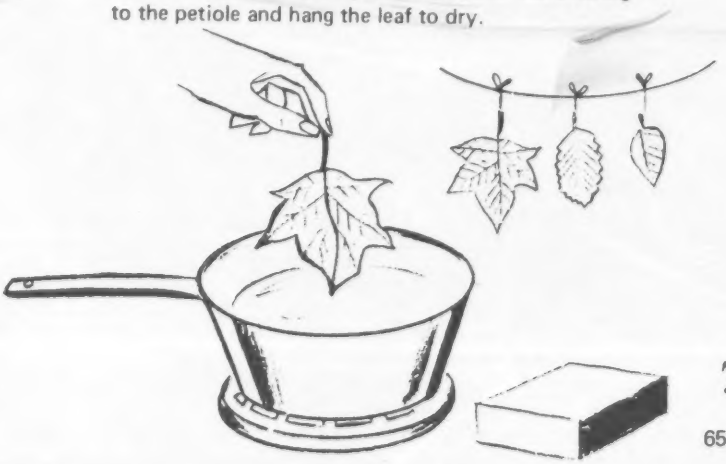
For spatter prints, place the leaf on a sheet of paper. Hold a piece of fine mesh screen, nailed to a wooden form, over the leaf. Push a toothbrush, dipped in paint, back and forth over the screen. Be careful that drops do not form on the bottom of the screen. Different colored paints can be used for different leaves.

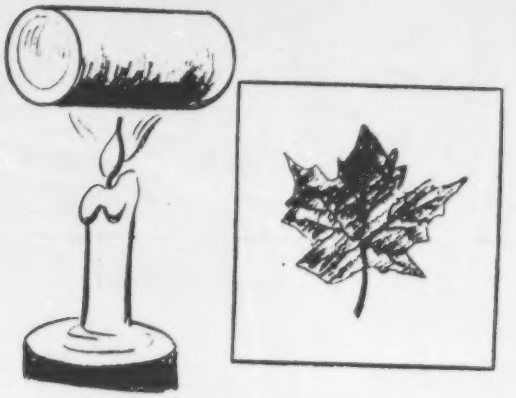


WAXING LEAVES

Materials you'll need:
pan, paraffin wax, heat source

Heat the wax until it melts. Dip a leaf into this solution by holding on to the petiole. Tie a string to the petiole and hang the leaf to dry.





MAKING SMOKE PRINTS

Materials you'll need:
grease, glass jars, candle, paper

Grease the outside of a glass jar. Hold this jar over a candle flame until the whole outside becomes dark gray with carbon. Place a leaf, underside up, on a stack of papers which will act as a cushion. Roll the smokey area of the jar over the leaf. Then put a white sheet of paper over the leaf. Roll again with a clean jar. The details of the leaf will appear on the paper. These are called smoke or carbon prints.

MAKING SKELETON LEAVES

Materials you'll need:
pressed and dried leaves, paper, hammer, plastic envelopes

To make it easy to study the arrangement of the veins in a leaf, first press and dry the leaf thoroughly. When the leaf is so dry it is brittle, place it between two sheets of paper. Pound it carefully so that all the plant cells except the veins crumble away and just the leaf skeleton remains. These may be sealed in plastic envelopes.

ART . . .

Fern or Flower Printing
by Mary Phyliss Baumer

Fern and Thumb Prints

Select a piece of fern about 8 – 10" long and put it to one side on a piece of newspaper. Then mix poster paint with liquid starch in a flat pan – you want a fairly thick mixture. Now run a brayer covered with the poster paint across the fern.

Lay the fern – paint-side down – on a piece of construction paper (any color) and place a pad of newspaper over this. Rub gently, remove the newspaper and fern, and you should have a fairly clear print of a fern on the paper.

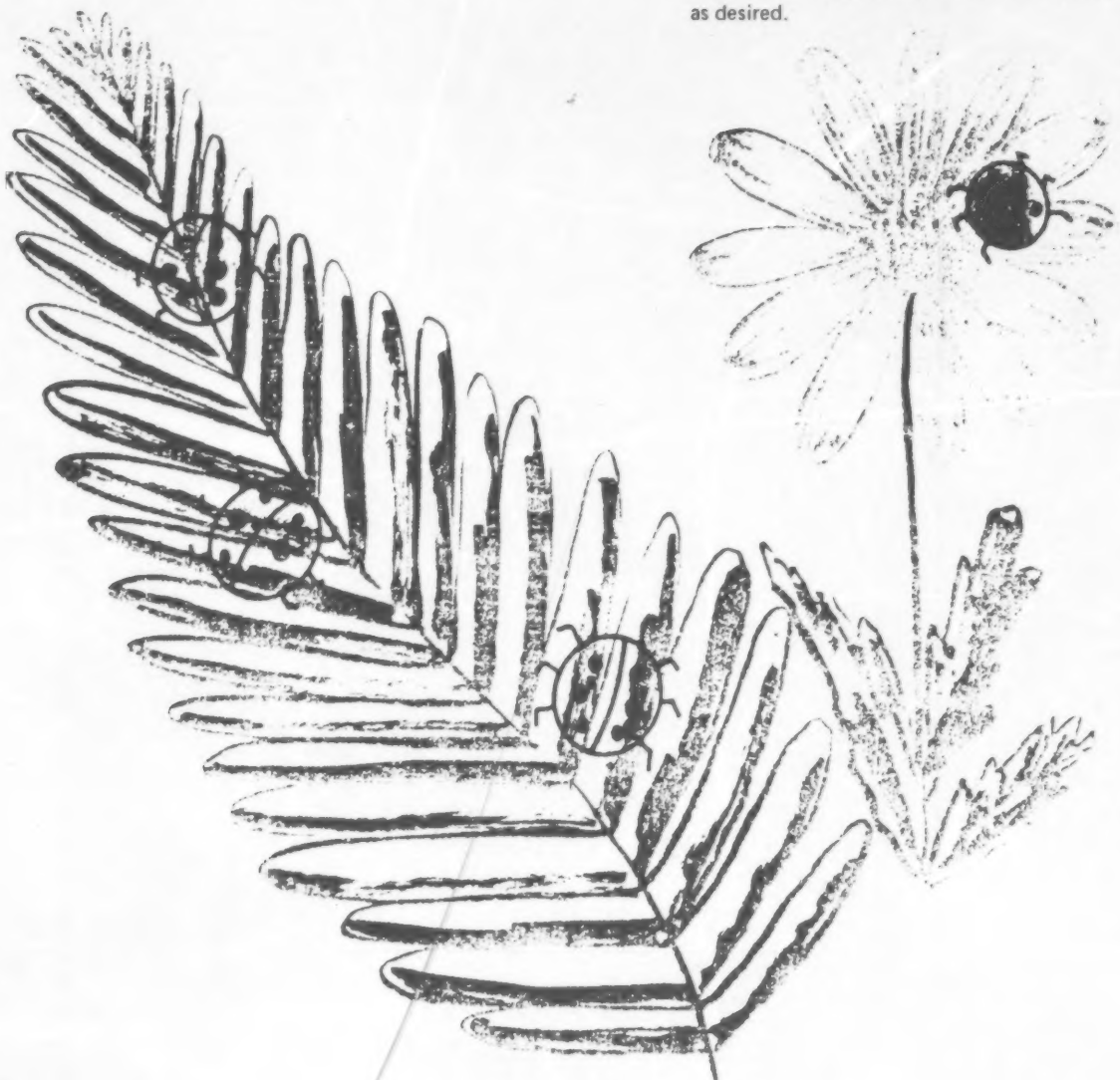
Now dip the ball of your thumb into red poster paint (or any color which contrasts with the fern print and the paper) and make several thumb prints on the fern print. When the thumb prints are dry, take a brush and black poster paint (or a pen and india ink) and draw a line down the middle of each thumb print, adding spots and legs as desired.

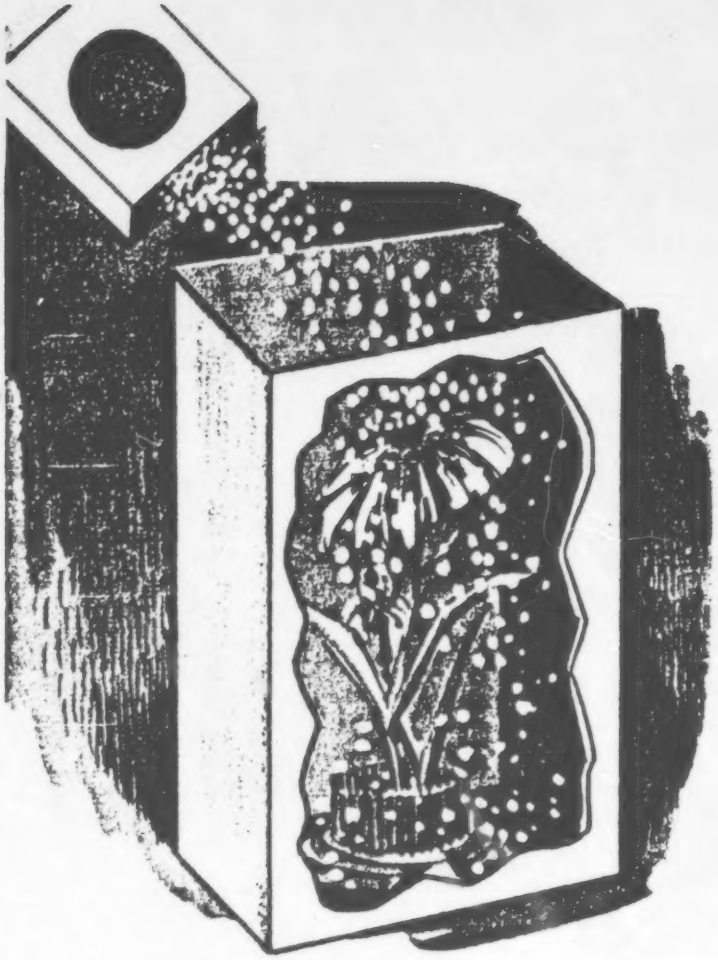
And behold! A fern covered with ladybugs.

Flower (and Thumb) Prints

A bouquet or pattern of flowers may be printed by using the same technique you used with the fern. Select a daisy (or any other fairly flat flower) and separate the bloom from the stem.

This time, you will need two pans of paint – one for the flower and one for the stem. Otherwise, the rest of the procedure is the same. Add ladybugs as desired.





PRESERVING SPIDER WEBS

Materials you'll need:
black and white construction paper, spray cans of white and black enamel, spray can of clear plastic

You can find spiders' webs in many places – corners of buildings, between two shrubs, between rows in a cornfield. They are very beautiful and well-worth collecting.

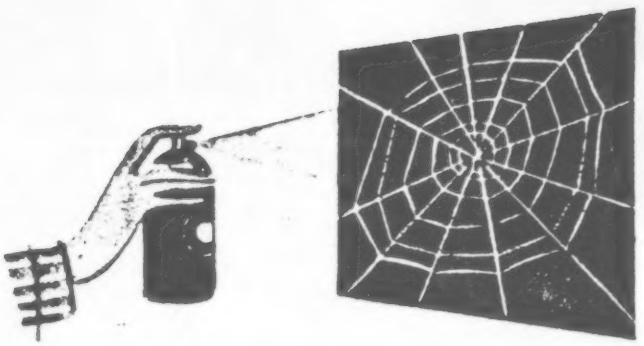
First, spray the web on both sides with either white or black enamel. Don't get too close or it might break. Next, carefully mount it on the contrasting construction paper, trying to touch all parts of the web to the paper at the same moment. Cut the web guide lines with scissors to free it. Lay it flat to dry and spray it with plastic in order to preserve it.

DRYING FLOWERS

Materials you'll need:
borax, large box, flower holder, specimens

Here is a wonderful idea for getting fall and winter bouquets of flowers out of season. Their colors and shapes remain practically unchanged.

The box you use must be taller than the upright flower. Stand the flower in the box using a flower holder to keep it centered and steady. Pour the borax gently around the flower until the flower is buried. Make sure the branches maintain their natural positions. It will take a week for a delicate flower to dry and several weeks to dry a thick, succulent flower. When the specimen is thoroughly dry pour off the borax. Save it to use again.



POETRY, PLEASE . . .

Featuring a Spring Theme: Trees

One way of approaching the presentation of poetry in the classroom is through the use of a theme. An appropriate theme might be Birds, The Month of May, Trees, Spring Flowers, and so forth. We will explore possibilities for the theme of TREES as they appear in the spring season.

COMPARING DIFFERENT KINDS OF TREES. Let children name as many different kinds of trees as they can. List the names on the board as children become acquainted with the great variety of trees they may have seen or heard of. Children who come from other parts of the country will know trees not common, perhaps, to your locale. Display any pictures of trees that you can find so children become acquainted with the familiar shapes of popular, palm, elm, and oak.

Take a TREE WALK with your class. You may walk along the sidewalk near your school to note the trees which can be seen in the parkway or people's yards. If you are near a park, you will find a greater variety of trees there in one place. Often college and university campuses have deliberately planted varied trees which are marked to aid identification.

After children have been exposed to names and identity of trees, read them the following poem as they listen for the kinds of trees mentioned.

A Salute to Trees
Henry Van Dyke

Many a tree is found in the wood,
And every tree for its use is good.
Some for the strength of the gnarled root,
Some for the sweetness of flower or fruit,
Some for shelter against the storm,
And some to keep the hearthstone warm,
Some for the roof, and some for the beam,
And some for a boat to breast the storm.
In the wealth of the wood since the world began,
The trees have offered their gifts to man.

I have camped in the whispering forest of pines,
I have slept in the shadow of olives and vines;
In the knees of an oak, at the foot of a palm,
I have found good rest and slumber's balm.
And now, when the morning gilds the boughs
Of the vaulted elm at the door of my home,
I open the window and make a salute:
"God bless thy branches and feed thy root!
Thou hast lived before, live after me,
Thou ancient, friendly, faithful tree!"

After reading this poem to the group, you may wish to discuss the ideas presented, for example:

What are the uses of trees?
Name some specific trees that have special uses.
What is the poet's feeling for trees?

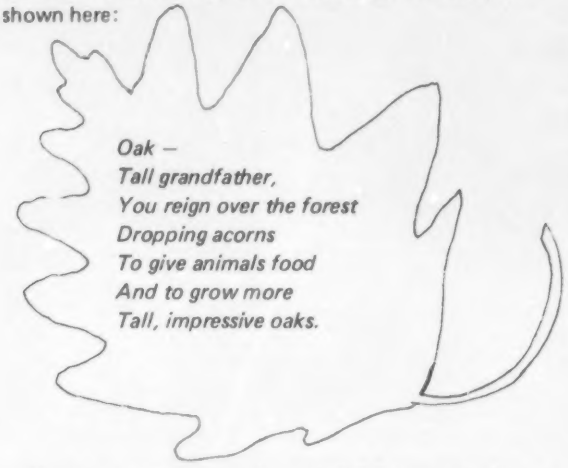
Able students will be challenged to investigate unusual products that we obtain from trees: quinine, tapioca, turpentine, and so forth. How have trees or parts of trees been important in literature and our way of living, for example, the laurel leaf, the olive branch, orange blossoms . . . ? Let students continue this list as it lends interest to the study of this theme.

Individual students can choose one tree or an idea about trees as a subject of a poem. Encourage children to express their ideas in free verse, thus:

Maple –
Giver of shade
Under whispering leaves
On a warm day.

As I look up, I see
You are covered with wings.

Poems written by individual students can be mounted on the shapes of the leaves of trees, as shown here:



Here is another poem by a well-known poet who talks about one specific tree, the apple tree.

The Planting of the Apple Tree
Willaim Cullen Bryant

Come, let us plant the apple tree!
Cleave the tough greensward with the spade,
Wide let its hollow bed be made;
There gently lay the root, and there
Sift the dark mold with kindly care,
And press it o'er them tenderly,
As round the sleeping infant's feet
We softly fold the cradle sheet;
So plant we the apple tree.

What plant we in this apple tree?
Buds which the breath of summer days
Shall lengthen into leafy sprays;
Boughs where the thrush with crimson breast
Shall haunt, and sing, and hide her nest;
We plant upon the sunny lea
A shadow for the noontide hour,
A shelter from the summer shower,
When we plant the apple tree.

What plant we in this apple tree?
Fruits that shall swell in sunny June,
And redden in the August noon,
And drop when gentle airs come by
That fan the blue September sky;
While children come, with cries of glee,
And seek them where the fragrant grass
Betrays their bed to those who pass,
At the foot of the apple tree.

If children have had any experience with poetry forms, it would be interesting to examine the form of this poem. Let children discover the PATTERN of the poem. The indented lines provide a clue to the pattern, for these lines end with the word tree or a rhyme for that word. They form a kind of triplet. The other lines pair in rhymed couplets, but the poet has carefully designed each stanza to fit a pattern.

The form of this poem should illustrate to children that they, too, can pattern a poem any way they wish. These stanzas are rather long, and the poet has repeated his pattern three times, but the student poet should feel free to develop his own pattern which can be repeated two or more times as he desires and as his poem requires.

Let each child choose a poem about trees that he would like to share with the group. The poem can be presented on what is called a POETRY BROADSIDE or poster, thus:

Let students share their poems with other classes as well as their own. The posters can be displayed in the main hall with leaf shapes uniting the display.

PRE-TEST & POST-TEST

A. Answer in your own words.

1. What is the primary source of food for most life?
2. What is the interrelationship of living things in their environment called?
3. What is the food-making process of green plants which takes place in the presence of sunlight called?
4. What is the main source of all energy?
5. List (or label) the main parts of a flower.
6. List 3 groups of lower plants.
7. What is the term used to describe the food makers in a food chain?
8. What is the area in which an animal or plant lives called?
9. How would the elimination of a predator, such as a hawk, in a forest food chain affect the forest community?
10. Identify 10 common leaves native to our area.

B. Each statement in column 2 tells about one of the words in column 1. On the blank in front of the word write the letter of the statement which belongs with the word.

1	2
_____ petal	a. part of the flower that forms the seeds.
_____ pollen	b. green coloring in plants.
_____ chlorophyll	c. fine powder which goes from stamen to pistil
_____ stamen	d. a leaf-like flower part that is usually not green.
_____ sepal	e. plant which cannot make its own food.
_____ pistil	f. part of the flower that forms the pollen.

_____ pollination

_____ dependent plant

g. pollen from stamens getting to pistils.

h. leaf-like, usually green, part around flower bud.

*C.

1. What did you enjoy the most about your trip to the Center?

2. What do you think could have improved your experiences at the Center?

* Part C will beomitted from the pre-test.

SOURCES FOR FREE AND INEXPENSIVE

ENVIRONMENTAL EDUCATION MATERIALS

American Forestry Assoc.: 919 17th St., N.W., Washington, D.C. 20006 – A membership organization "for advancement of intelligent management and use of forests and related resources."

American Petroleum Institute: 1271 Avenue of the Americas, New York, N.Y. 10020

Keep America Beautiful, Inc.: 99 Park Ave., N.Y., N.Y. 10016

National Assoc. of Soil and Water Conservation Dists.: 1025 Vermont Ave., N.W. Washington, D. C. 20005. An organization of local soil and water conservation districts.

Louisiana Wild Life and Fisheries Commission Wild Life and Fisheries Buildings 400 Royal Street, New Orleans, 16, Louisiana

United States Department of Agriculture , Soil Conservation Service, P. O. Box 1630 Alexandria, Louisiana 71301

National Geographic So.: 1145 17th St., N.W. Washington, D. C. 20036

Soil Conservation Society of America: 7515 N. E. Ankeny Road, Ankeny, Iowa 50021

United States Dept. of Agriculture, Extension Service: 14th St. and Jefferson Dr., S. W. Washington, D. C. 20250

United States Dept. of Agriculture, Forest Service: Washington, D. C. 20250

United States Dept. of the Interior, Fish and Wildlife Service: Washington, D. C. 20240

United States Dept. of the Interior, National Park Service: Interior Bldg. Washington, D. C. 20240